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CONFERENCE ON INTERSTATE POLLUTION OF THE PEARL RIVER (LOUISIANA-MISSISSIPPI) HELD AT NEW ORLEANS, LOUISIANA ON 22 OCTOBER 1963

Public Health Service
Washington, D. C.

22 October 1963

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CONFERENCE
ON
INTERSTATE POLLUTION
OF THE
PEARL RIVER

[LOUISIANA-MISSISSIPPI]

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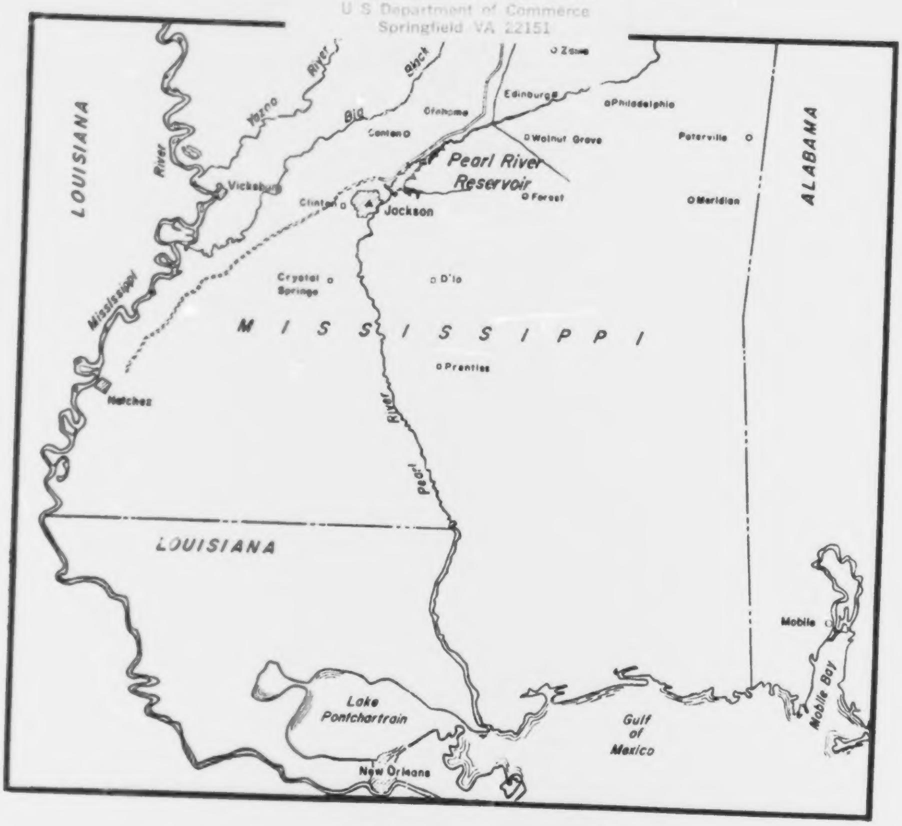
LOUISIANA
Mississippi River
Yazoo River
Big Black
Vicksburg
Canton
Ofahoma
Edinburg
Zama
Philadelphia
Walnut Grove
Poterville
ALABAMA
Pearl River Reservoir
Clinton
Jackson
Forest
Meridian
Crystal Springs
D'lo
MISSISSIPPI
Prentiss
Natchez
Pearl River
LOUISIANA
Mobile
Mobile Bay
Lake Pontchartrain
Gulf of Mexico
New Orleans

NEW ORLEANS, LOUISIANA

OCTOBER 22, 1963

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

CONFERENCE

In the Matter of:

Pollution of the interstate waters of the Pearl River and its tributaries, involving the States of Louisiana and Mississippi and the Department of Health, Education, and Welfare, held in Room T-13028, Federal Office Building, 701 Loyola Avenue, New Orleans, Louisiana.

October 22, 1963

* * *

MURRAY STEIN, Chairman,
Department of Health, Education, and Welfare
Washington, D. C.

HAROLD C. TAYLOR
Division of Water Supply and Pollution Control
Department of Health, Education, and Welfare
Atlanta, Georgia

R. A. LAFLEUR, Executive Secretary
Louisiana Stream Control Commission
Baton Rouge, Louisiana

JOHN TRYGG, State Sanitary Engineer
Baton Rouge, Louisiana

J. E. JOHNSTON, Director
Division of Sanitary Engineering
Mississippi State Board of Health
Jackson, Mississippi

BILLY GRANTHAM
Mississippi Game and Fish Commission
Jackson, Mississippi

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PROCEEDINGS

CHAIRMAN STEIN: The Conference is open.

This conference in the matter of pollution of the interstate waters of the Pearl River and its tributaries, involving the States of Louisiana and Mississippi and the Department of Health, Education, and Welfare, is being held under the provisions of section 8 of the Federal Water Pollution Control Act.

Under the provisions of that Act, the Secretary of Health, Education, and Welfare is required to call a conference of this type, when on the basis of reports, surveys, and studies, he has reason to believe that pollution of interstate waters subject to abatement under the Federal Act is occuring.

The purpose of the conference is to bring together the state water pollution control agencies, the representatives of the Department of Health, Education, and Welfare, and other interested parties to review the existing situation, the progress which has been made, and to lay a basis for future action by all parties concerned, and to give the states, localities, and industries an opportunity to take any remedial action which may be indicated under state and local law.

The conference technique is rather an old one. It is used by many state agencies informally in the normal conduct of their business in the field of water pollution control. The concept of a conference was proposed by the United States Supreme Court as long ago as 1921 in the famous case of New York against New Jersey involving interstate pollution.

I would like to quote from the court opinion:

"We cannot withhold the suggestion, inspired by the consideration of this case, that the grave problem of sewage disposal presented by the large and growing populations living on the shores of New York Bay is one more likely to be wisely solved by cooperative study and by conference and mutual concessions on the part of representatives of the states so vitally interested in it than by proceedings in any court, however constituted."

We strongly support the conference technique, and we in the Federal Program measure our success by the situations solved at the conference stage rather than by the court actions we bring.

Under section 8 of the Federal Water Pollution Control Act, the Secretary of Health, Education, and Welfare has notified the official state water pollution control agencies of the conference. These agencies are the Louisiana Stream Control Commission and the Mississippi State Board of Health.

Louisiana will be represented by Mr. R. A. Lafleur, Executive Secretary of the Louisiana Stream Control Commission, and Mr. John Trygg, State Sanitary Engineer of Louisiana.

The State of Mississippi will be represented by Mr. J. E. Johnston, Director, Division of Sanitary Engineering, Mississippi State Board of Health, and Mr. Billy Grantham of the Mississippi Game and Fish Commission.

Mr. Harold C. Taylor from our Division of Water Supply and Pollution Control, with headquarters in Atlanta, Georgia, has been designated as the conferee for the Federal Government.

My name is Murray Stein, and I am from Washington, D. C., headquarters of the Department of Health, Education, and Welfare.

The representatives of the official agencies are privileged to bring whomever they wish to the conference and have them participate in it. However, this is a conference between the state representatives and the representatives of the Department of Health, Education, and Welfare. These parties constitute the conferees.

Both the states and the Federal Government have responsibilities in dealing with interstate water pollution control problems. The Federal Water Pollution Control Act declares that the states have primary rights and responsibilities for taking action to abate and control interstate pollution. It has always been the policy of the Department of Health, Education, and Welfare to give full recognition to this traditional role of the states. The function of the Department is to encourage the states in these activities. However, the Department of Health, Education, and Welfare is charged by law with specific responsibilities in connection with interstate pollution control problems.

The Federal Water Pollution Control Act provides that pollution of interstate waters, whether the matter causing or contributing to such pollution is discharged directly into such waters, or reaches such waters after discharge into a tributary of such waters, which endangers the health or welfare of persons in a state other than that in which the discharge originates, is subject to abatement. The conference will be useful, we hope, in providing a clear picture of the problem, in delineating the progress which has already been accomplished, and in indicating what still needs to be done to correct the problem.

Under Federal law the Secretary is required, at the conclusion of the conference, to prepare a summary of it which will be sent to all the conferees. The summary, again according to law, must include the following:

1. Occurrence of Pollution of interstate waters subject to abatement under the Federal Act;

2. Adequacy of measures taken toward abatement of the pollution; and

3. Nature of delays, if any, being encountered in abating the pollution.

Subsequent to the holding of the conference, the Secretary of Health, Education, and Welfare is required to make recommendations for remedial action if such recommendations are indicated.

Now a word about the procedures governing the conduct of the conference. A verbatim transcript will be made of the conference to give us a record of what is said and done here and to enable us to provide a meaningful summary.

Mr. Leonard is making this stenographic report. We will make copies of the summary and the transcript available to the official state water pollution control agencies of Louisiana and Mississippi. Anyone wanting copies of this transcript should get in touch with these state agencies. We have found that this is the best way of assuring the maintenance of proper Federal-State relations by supplying the copies of the summary and transcript to the state agencies.

All the conferees will be called upon to make statements. The conferees, in addition, may call upon participants they have invited to the conference to make statements. At the conclusion of such statements, the conferees will be given an opportunity to ask questions or comment. This procedure has proved effective in the past in developing a clear picture of the problem and in reaching agreement on equitable solutions.

At the end of all the statements, we will have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we will attempt to summarize the conference orally, giving the conferees, of course, the right to amend or suggest modifications of the summary. Of course, subsequently a written summary will be sent to the conferees.

Before we call on the conferees for their presentations, we would like to ask them if they have any people they would like to introduce.

Mr. Taylor?

MR. TAYLOR: Yes. Thank you, Mr. Stein.

Mr. Chairman, fellow conferees, ladies and gentlemen:

Before proceeding with the formal statement of the Public Health Service, I would like to introduce some of the Federal Representatives here convened for this conference. Gentlemen, will you please stand and be recognized when I call your name?

First, I would like to recognize Mr. John R. Thoman. Will you please stand, Mr. Thoman? Mr. Thoman is the Regional Program Director of Water Supply and Pollution Control of the Public Health Service, Region IV, in Atlanta. Mississippi is located in the Atlanta Region of the Public Health Service.

Next, I would like to recognize Mr. Jerry Svore. Mr. Svore, will you please stand. Mr. Svore is the Regional Program Director of Water Supply and Pollution Control, with headquarters in Region VII, Dallas, Texas. Louisiana being in Region VII of the Public Health Service.

Now, Mr. Robert Brown -- I don't believe Mr. Brown is here, Mr. Brown is the Assistant Regional Director of the Department of Health, Education, and Welfare, Region IV in Atlanta. I presume he will be here shortly.

Next, Mr. Eli Kaplan. Mr. Kaplan, will you please stand? Mr. Kaplan is the Assistant Regional Attorney with the Department of Health, Education, and Welfare, Region IV, headquarters in Atlanta, Georgia.

I don't believe I have any further federal representatives.

CHAIRMAN STEIN: How about you, Mr. Lafleur?

MR. LAFLEUR: Thank you Mr. Chairman.

I have two, and possibly three, gentlemen that I would like to have recognized at this time.

The first one is Mr. Leo Huff, State Geologist with the Department of Conservation, who is a member of our Stream Control Commission.

Another is Mr. Ernest Epps, Chief Chemist with the Department of Agriculture and Immigration -- also, a member of our Stream Control Commission.

And representing the Department of Commerce and Industry is Mr. Al Terbourne. Will you stand, please?

CHAIRMAN STEIN: Mr. Johnston, do you have anyone to introduce at this time?

MR. JOHNSTON: Well, I think there are quite a number of people from Mississippi, who will have a statement to make. However, I believe it would be wise if the Mississippi delegation would stand. I would call on, first, Mr. Hugh Boren, who is the Governor's Administrative Assistant. Mr. Boren, will you stand up? And with him, there, is Mr. Bailey with the A. & I. Board of Mississippi.

And Mr. Garland Lyell, who is Assistant Attorney General, is present today; and Mr. Crosby is here. There are attorneys and several other people who will have a statement to make later.

Is Mr. Williamson, the Mayor of Picayune, here today?

MR. A. J. REID: I am Reid, the City Manager. I am here in his place.

MR. JOHNSTON: Thank you, Jack. Mr. Jack Reid.

Now Mr. Robertson, who is past president of the Mississippi Wild Life Federation. Mr. Robertson, will you stand?

And Mr. C. W. Beggenly, who is a private citizen, who lives on the banks of the Pearl River; and Mr. Grisp with the Game and Fish Commission of Mississippi.

Here's Mr. Bill Demoran, with the Marine Conservation Commission.

And Mr. Jack Pepper, who is an engineer with the Mississippi Water Board, Board of Water Commissioners.

Mr. Horace Lester, one of the members of the Legislature from Mississippi.

Have I missed any of the people from Mississippi? If we have delegations of other people from Mississippi, I wish they would please stand.

I believe that is all, Mr. Chairman. Thank you.

CHAIRMAN STEIN: Thank you, Mr. Johnston.

Before we call on Mr. Taylor, I would just like to indicate, to facilitate the record, anyone making a statement should come up to the lectern and identify himself as to name and affiliation; and we will accept, I hope, for the record, if it is not too voluminous, all material that you want to put in, with one proviso. We don't reproduce in color, and I am not sure that any of you do have color reproductions. We have black and white reproductions only. Now I think that needs some explanation. Let me go off the record on that.

(Discussion off the record.)

CHAIRMAN STEIN: We will call on Mr. Taylor.

MR. TAYLOR: Thank you, Mr. Chairman.

I will proceed at this time with a very brief opening Public Health Service statement.

It is a privilege to be here today as the conferee representing the Public Health Service. It is my hope and belief that this conference will prove to be an effective and beneficial means of developing a common ground of understanding or agreement of how we can best preserve and protect one of our most valuable water resources, the Pearl and East Pearl Rivers, serving the States of Louisiana and Mississippi.

It is a well accepted and proven fact, I believe, that such problems as water pollution control are better and more wisely solved by cooperative study and effort and by this conference technique, as Mr. Stein has pointed out. By bringing together the official state water pollution control agencies, representatives of the Federal Government, and representatives of other state, local and industrial interests, we have taken a major step forward, I believe.

This conference provides an orderly procedure for developing information and arriving at equitable conclusions and solutions leading to corrective measures.

Now, Mr. Chairman, at this time the Public Health Service would like to give an evaluation and report on the pollution of interstate waters on the Pearl and East Pearl Rivers. This report was prepared by the Robert A. Taft Sanitary Engineering Center of the Public Health Service in Cincinnati on the basis of a cooperative field study and other information made available to the survey team. So, Mr. Chairman, if I may at this time, I would like to call on Mr. John M. Fairall, Chemical Engineering Consultant of the Public Health Service of the Robert A. Taft Sanitary Engineering Center in Cincinnati, to give a summary of this report.

Mr. Fairall.

MR. JOHN M. FAIRALL: Mr. Taylor, Mr. Chairman, conferees, ladies and gentlemen: This mike is only for the purpose of a tape recorder, I might say. I'll try to talk loud enough so you can hear my natural voice without any amplification.

In a letter dated December 14, 1961, Dr. A. L. Gray, Executive Officer of the Mississippi State Board of Health, indicated a vital concern regarding the quality of the water of the Pearl River and requested the U. S. Public Health Service to make a water quality study of the stream.

The Public Health Service has completed the requested study. In addition, it has reviewed studies made previously, both by itself and the State of Louisiana. These findings have caused the Secretary of Health, Education, and Welfare to believe that pollution of interstate waters of the Pearl River and the East Pearl River by wastes originating in Louisiana and Mississippi is endangering the health or welfare of persons in Louisiana and Mississippi. Accordingly, he has called this conference in New Orleans on this date, October 22, 1963, to review the problem.

I would like to enter a copy of the report for the record at this time.

CHAIRMAN STEIN: The report will be entered. Do you want the report to appear in the record, as you read it, rather than your summary?

MR. FAIRALL: I think it should probably appear, as printed, completely in the record, because of limitations of time we have to make it a little briefer.

CHAIRMAN STEIN: Without objection, it will appear as read. Go ahead.

MR. FAIRALL: A brief summary of these findings is as follows:

During a period, September 11 to October 2, 1962, the interstate reaches of the Pearl River downstream from the northeast corner of Louisiana, the East Pearl River, and the oyster beds of Mississippi Sound were surveyed to determine the extent of pollution of these interstate waters.

The interstate waters of the two rivers are used for fishing and boating, and there is a potential use for water skiing.

The Pearl River was polluted for approximately 26 miles below the mouth of Bogue Lusa Creek. The source of this pollution was the untreated sewage from the City of Bogalusa, Louisiana, and the wastes from the integrated kraft pulp and paper mill operated by the Bogalusa Division of the Crown Zellerbach Corporation.

The bacterial pollution in the raw sewage from the City attained densities 168 times the accepted maximum value for water contact sports and nearly 34 times that for general recreational use. The solids in the sewage would have created an unsightly condition in the stream, but the contribution from the city was far overshadowed by the wastes discharged from the pulp and paper mill.

The lost fiber from the mill had created a mound of material at the mouth of Bogue Lusa Creek. Other mill solids and fibers settled on the bottom of the river and the gases of decomposition bubbled to the water surface accompanied by partially decomposed sludge which floated on the surface of the water in clumps of assorted sizes. Oily wastes from the mouth of the creek clung to any object at the waterline, especially boats at Richardson's Landing.

The oxygen-consuming wastes from the pulp and paper mill and the decomposing sludge above Pool's Bluff Sill lowered the D.O. in the river to average values of 4.0 mg/l during the survey. A value of 1.1 mg/l had been predicted for high temperature, low flow periods and was subsequently observed by the Louisiana Stream Control Commission personnel in June, 1963.

The degradation of the stream, which was observed at the surface, was confirmed by biological investigations of the bottom of the stream, where great numbers of a few types of pollutional tolerant worms were found.

The sedimentation provided above Pool's Bluff Sill and the reaeration of the water falling over the Sill, 9 miles below Bogue Lusa Creek, improved the appearance and dissolved oxygen of the stream below the Sill; but the biological investigations indicated that the stream did not show positive signs of recovery within 7 miles below the Sill, and not until it had flowed another 10 miles had the stream recovered from the wastes discharged from Bogue Lusa Creek.

A minimum average dissolved oxygen of 5.3 mg/l was observed 18 miles below the Sill and a minimum average value of 4.6 mg/l is to be expected at lower stream flows, with similar waste loads.

On the east Pearl River the intrastate waters in Hobolochitto Creek were polluted by the waste discharges from Crosby Chemicals, Inc. The dissolved oxygen was reduced to an average value of 2.5 mg/l during the survey, and the biological samples showed distinct adverse effects from pollution.

The interstate waters of the East Pearl River started to recover from the industrial pollution above Jackson's Landing, but the raw sewage discharged to the river below Jackson's Landing by the City of Picayune, Mississippi, developed bacterial densities in the river 120 times the maximum value acceptable for water contact sports and 24 times that for general recreation.

A discharge or discharges from Crosby Chemicals, Inc. on or about September 26, 1962, killed great numbers of fish in Hobolochitto Creek and in at least 17 miles of interstate water. Bottom organisms were also reduced to only a few tolerant species.

It is concluded that:

1. Untreated municipal sewage discharged by the Cities of Bogalusa, Louisiana, and Picayune, Mississippi, endangers the health or welfare of persons in Mississippi and Louisiana.

2. Pulp and paper mill wastes discharged by the Bogalusa Division of the Crown Zellerbach Corporation endangers the health or welfare of persons in Mississippi.

3. Industrial wastes discharged by Crosby Chemicals, Inc. endanger the health or welfare of persons in Louisiana.

4. This pollution of interstate waters is subject to abatement under the Federal Water Pollution Control Act.

I would like to summarize some of the previous surveys. This survey we made last year was not the only one done on the stream.

In 1950 the U. S. Public Health Service made a survey of the Pearl River from Bogue Lusa Creek down below Walkiah Bluff and found that pollution existed for 43 miles below Bogue Lusa Creek.

In 1962 the Louisiana Wildlife and Fisheries Commission made a report on substantially the same reach of river and found that pollution existed from Bogalusa to 8 to 10 miles below Pool's Bluff Sill, and in 14 grab samples obtained from the sewage discharges of the pulp and paper mill, found an average rate of B.O.D. discharge of 76,000 pounds per day. In an addendum to this 1962 report it was disclosed that Crown Zellerbach proposes to discharge primary treated wastes from the production of 1500 tons of paper per day, containing 62,000 pounds of B.O.D. per day.

In 1962 the Louisiana State Board of Health released their report on the Oyster Water Survey of the Pearl River and Mississippi Sound. At the time of the survey, no pollution was found over the oyster beds, but the report did recommend that supplementary data be collected when practicable during medium and high river stages, when bacteria from upstream sources of pollution might be carried out to the oyster beds.

May I have Figure 1, please? This slide is a presentation of the whole Pearl River System, showing its major streams; but today we are primarily interested --

CHAIRMAN STEIN: Mr. Fairall, just a moment. Can everyone hear him when he is back in there, or not?

MR. FAIRALL: I will try to keep my head out, this way, Murray, so my voice will carry better.

We are primarily concerned with the streams down along the state boundary, here, which is roughly down here on what I would call the Lower Pearl. The state boundary crosses it over here and the East Pearl becomes the state boundary on down into the interstate waters.

May I have figure 2, please? First, I would call attention to the fact that north is to your left, and the flow of the stream is from left to right. The rest of the maps we will be showing today all have that same orientation. As I called to your attention before, we are primarily concerned with the waters along this state boundary indicated by this line, here, which is a part of the stream, and continuing on down here, crossing over to the East Pearl, here, and on down and out into the Lake Borgne.

I would like to particularly call your attention to Bogue Lusa Creek, which receives the wastes from Crown Zellerbach and the City of Bogalusa, and carries these wastes out into the Pearl River. We will also be talking about Richardson's Landing, located about here on the river, and Pool's Bluff Sill or Dam is shown on most of the maps as a rectangle; and then, Walkaih Bluff down here, which is our farthest downstream survey station on the interstate waters of what I have chosen to call the Lower Pearl River.

We also have another feature here that you may wonder about, and that is the Barge Canal, starting above the Sill, here, and going down to discharge into Holmes Bayou.

May I have Figure 3, please? This is the East Pearl River System, again with the same orientation, north to your left. We have the headwaters of thePearl River, here, the two Hobolochitto Creeks.

Maybe if we could have some lights here.

CHAIRMAN STEIN: This is fine, Mr. Fairall. Go ahead.

MR. FAIRALL: We have the two headwaterstreams of the Pearl River System, here, East Hobolochitto Creek and West Hobolochitto Creek, joining here at the City of Picayune, then flowing on down to the state line, where the stream becomes the East Pearl River.

We will be mentioning Farr's Slough, which probably during high stream flow does carry flow from the Lower Pearl River on over into the East Pearl, but during the period of the survey there was not any flow between the two streams. So essentially they were two separate water systems. We'll be mentioning the waste discharges from Crosby Chemical entering the stream at this point, and the waste discharges from the City of Picayune entering the stream at this point. We may mention the downstream towns of Gainsville, Logtown and Pearlington.

Then, out in here we have the salt water area. Now you can turn the slides off a little while, Mac. I had hoped we could avoid this flashing on and off of lights, but I guess not. I don't like it.

The salt water area considered in this report extends from the Rigolets to Waveland, Mississippi, and includes part of Mississippi Sound, Grass Island, Grand Island, and LePetit Pass Island. Lake Pontchartrain and the Pearl Rivers contribute fresh-water flow to the area.

There are a number of water uses on these streams.

The Bogalusa Division of Crown Zellerbach Corporation takes part of its industrial water supply from Bogue Lusa Creek, and Crosby Chemical Corporation takes water from Hobolochitto Creek.

The recreational use of the stream -- the Pearl River System is used throughout its length as a fishing stream. Some of the Lower Pearl is a wilderness stream and may be used more extensively as population densities increase and conveniently located boat landings are provided. The area immediately above the Sill is utilized to some extent. Sport fishing activity in the spillway, immediately below the Sill, is popular. Water skiing is primarily confined to the barge canal, although the pool immediately above the Sill is utilized as a turning basin while skiing.

Some stock cattle are allowed to graze in the woods of the river bottoms and have access to the stream, particularly in the upper reaches where the forest is not so heavy.

The salt water area is traversed by the Intercoastal Waterway from the Grand Island Channel through Grand Island past Pearl River Light to the Rigolets. The barge canal on the Pearl River from Holmes Bayou to Pool's Bluff provides a potential navigational use of the stream.

Mississippi Sound west of Biloxi, Mississippi, is open for oyster harvesting during certain periods of the year. The harvest in Louisiana waters was 33,000 barrels in the 1960-1961 season.

The municipal wastes being discharged into the stream are from the City of Bogalusa and the City of Picayune. At Bogalusa a primary treatment plant was under construction at the time of the survey, which would serve about two-thirds of the total population of 21,000 people. The balance of the population, or about 7,000, will still be discharging raw sewage into Bogue Lusa Creek.

At Picayune, Mississippi there is a small pond above Highway 11, which treats a small subdivision or area, but the rest of the town with a sewer population of approximately 6,000 is pumping raw sewage into the East Pearl River near Jackson's Landing or the old wooden bridge.

Other communities on the streams under consideration are not known to have public sewer systems.

Industrial wastes being discharged into the stream:

At Bogalusa, Louisiana, the Crown Zellerbach Corporation operates an integrated kraft sulphate pulp and paper mill. During the survey the production was on the order of 825 tons per day of the sulphate pulp, 110 tons per day of neutral sulfite semi-chemical pulp, 115 tons per day of secondary paper pulp, and occassionally up to 160 tons per day of bleached pulp. Waste waters from these operations are discharged to Bogue Lusa Creek at two points opposite the new municipal sewage treatment plant. A chemical by-product plant which produces dimethyl sulfide and dimethyl sulfoxide was not operating at the time of the survey.

At Picayune, Mississippi, there are three sources of industrial wastes. Crosby Forest Products, which impregnates lumber products with creosote, and a dairy discharge wastes to the storm sewer canal in the southern part of the town, which drains southwestward beyond the city limits to a natural watercourse or branch, eventually discharging to the East Pearl downstream from the municipal sewage outlet.

The third source of industrial waste, Crosby Chemicals, Inc., processes crude tall oil and crude sulphate turpentine. The wastes from the tall oil operations discharge to a pond with provisions for skimming. These Crosby Chemical wastes are discharged to Hobolochitto Creek downstream from Beech Road.

I would like to present some of the data which we collected at this time. All of the tabulated data is in the report, and I will discuss the rest of the data -- pertinent data from the charts.

The flows were reasonably uniform during the survey -- the stream flows were reasonably uniform. They were well below average, but they were not at the record low flows.

On the Lower Pearl River the principal wastes are pulp and paper mill and municipal wastes discharged to Bogue Lusa Creek or Coburn Creek to the Lower Pearl. During the period of the survey, Crown Zellerbach Corporation collected 24-hour composite samples of their wastes and reported an average rate of flow of 25.8 million gallons per day, with an average discharge of 53,000 pounds of B.O.D. per day to the streams, along with 45,000 pounds of pulp losses per day.

During this same period the U. S. Public Health Service took daily grab samples from the two sewers discharging from Crown Zellerbach. The rate of flow at the time the grabs were obtained had an average rate of flow of 41.9 million gallons per day, and the rate of B.O.D. discharge at the time the grabs were obtained was 41,600 pounds of B.O.D. per day. This substantially was the same type of values as Crown Zellerbach reported.

The average discharge from Bogue Lusa Creek directly to the stream was 34,200 pounds per day.

The pertinent data to be discussed are the biological investigations, the bacteria as total coliform and fecal coliform, and the dissolved oxygen in the stream.

For the biological investigations we have selected bottom dwelling organisms to indicate stream conditions on the bottom. These bottom dwelling organisms have been selected because their response to pollution is pronounced; their length of life cycle is sufficiently long, preventing a sudden response to intermittent relief from pollution; the animals are incapable of extended migration, and the influence of neighboring water conditions is thereby reduced. These animals reflect the bottom conditions at a sampling point for an extended period of time.

We are also concerned with the presence of clean water organisms which serve as fish food.

May I have Figure 4, please? This slide shows the numbers of species or kinds of organisms at each one of the sampling stations. I would like to make a correction right now with regard to this slide and the next slide. It is shown as a sampling station here, close to Richardson's Landing. Actually, this sample, as reported here on the chart, was taken between the mouths of the two creeks, so that the pollution from Bogalusa had not yet entered the stream.

We find always in clean streams that we have large numbers of organisms -- pardon me, large numbers of species; a large variety of species in clean waters. That is what we found here, upstream from the source of pollution of Bogue Lusa Creek, we found large numbers of species. As we got on downstream below the pollution, where the stream was recovering, we again found a large number of species. We found very few species, a limited number, below the discharges from Bogue Lusa Creek, and above and below the Sill.

May I have Figure 5, please? This slide presents the mean number of organisms per square foot of the stream at the sampling point. Again, this value here should be for a sampling point between the mouths of the creeks.

In clean streams we find acceptable numbers of organisms per square foot on these orders of value -- I don't know; probably less than 100. But in polluted streams we find very large numbers of unacceptable, undesirable organisms. In this case they even exceeded 2,000; probably all sludge worms, per square foot. We found large numbers of organisms above and below the Sill, as evidenced by these values, probably up around 800 or 900.

Coburn Creek exhibited little flow at the time of sampling. Floating solids were obvious. The bottom was covered by organic material, some digested, some raw wood materials, and bubbling of decomposition gases was obvious. Wood fibers were observed in microscopic examination of collected samples. Only one sludgeworm was found near the mouth of Coburn Creek, indicating conditions to be so severe that tolerant organisms could not establish or maintain themselves.

Bogue Lusa Creek had a discharge of about 50 cubic feet per second. The water was distinctly colored, odoriferous, showed an occasional oil slick, and carried a large quantity of suspended wood fiber. Digested sludge was not evident on the bottom. However, freshly deposited wood remains composed of chips, bark and fibers, were noted. A sludge bank formed at the mouth was covered with a matted fiberboard, where the recently deposited wood fibers had been exposed to dry. No organisms were found in the mouth of Bogue Lusa Creek.

At Richardson's Landing, a short distance below the confluence of Bogue Lusa Creek, large quantities of floating solids were observed on the Pearl. The bubbling of gases indicated the presence of heavy organic loads.

Three miles below the mouth of Bogue Lusa Creek the number of sludgeworms was 12 times as great as at the upstream control station, and just above Pool's Bluff Sill the number of sludgeworms was 5 times as great as that found at the upstream control station. These worms were found in great numbers only where river currents allowed deposition of organic solids. These stations were severely polluted.

May I have Figure 6, please? Coliform bacteria were determined as an indicator of probable presence of pathogenic or disease-bearing bacteria and viruses, and recorded as coliform density in terms of most probable number (MPN) per 100 ml. A more specific indicator of bacteriological pollution involves bacteria specifically of fecal origin and is expressed in terms of MPN of fecal coliform per 100 ml.

For water contact sports it is generally accepted by public health authorities that the coliform density should not exceed 1,000 MPN per 100 ml., and for general recreational use and surface water supplies where water treatment plants are in use, it is generally accepted by the same authorities that the coliform density should not exceed 5,000 MPN per 100 ml. These data are summarized here in Figure 6. I would like to point out a few things on them.

Down here, at the bottom of the chart, this short dashed line is our 1,000 MPN/100 ml. water contact objective; and at this longer dashed line, here, we have our 5,000 MPN/100 ml. general recreation objective.

During the survey we did not find any station that had an average value below the water contact objective of 1,000, and at only two places did we find an average value below the general recreation objective of 5,000 MPN.

The wastes discharged from Bogue Lusa Creek multiplied in the stream and went up to a value of almost 170,000 MPN per 100 ml., and then died off as the water flowed on down the stream.

The black bars here are the fecal coliform MPN, indicating very definitely that this pollution was from warm-blooded animals. You can leave that on for a minute, Mac.

The concentration or amount of organic pollutional material being discharged in the stream or measured in the stream is expressed as 5-day B.O.D., biochemical oxygen demand, and is generally referred to simply as B.O.D. in this report.

The effect on the stream of oxygen consuming pollutional material that is expressed as B.O.D. may be measured as D.O., or dissolved oxygen, and is summarized in Figure 8 of the report. May I have Figure 8, please?

It is generally accepted to be desirable to maintain an average concentration of 5 mg/l of dissolved oxygen in a stream in order to provide a healthy biological environment. The average concentration of dissolved oxygen at the various stations during the period of the survey is shown as a white bar on the figure, and the minimum values of single samples are shown as dark bars. In the unpolluted reaches of the stream above the sources of pollution and on down here in the delta area, dissolved oxygen values of 6.0 to 7.5 were good average values readily maintained. Right here at the mouth of Bogue Lusa Creek, once in a while we caught a little oxygen there. Most of the time it was zero, and we had an average value that was very, very low. There were no organisms living here in the mouth of Bogue Lusa Creek.

The oxygen which was in the stream above Bogue Lusa Creek was soon depleted by the wastes flowing in from the creek - sagged oft, immediately and right above the Sill had an average value of 4.0 mg/l. This dashed line here is our 5.0 mg/l objective for dissolved oxygen.

After the stream flowed over the dam, it was reaerated by spilling over the dam to an average value almost up to 6.0 mg/l, and then sagged off slightly going on downstream, and started to recover here about Walkiah Bluff.

May we have Figure 10, please? An annual low flow of 1500 cfs for one day can be expected at Bogalusa Gauge on the Pearl River. During the survey the flows were on the order of 2,000 cfs. Once in ten years an average discharge of 1100 cfs for a period of seven days can be expected. Oxygenation constants and stream reaeration constants for the oxygen sag curve observed during the period of this survey were calculated on an electronic analog computer, as detailed in Appendix C of the report. Using these constants, dissolved oxygen concentrations for other stream conditions were calculated on the analog computer. The results of some of these computations are shown on Figure 10.

In these computations with the analog computer you sometimes set the computer up to simulate a stream system or stream condition. And in this curve, here, for the observed conditions during the survey at 2000 cfs, 25° C., we reproduced the same thing as I just showed you on the previous curve. The oxygen in the stream was rapidly depleted by the wastes from Bogue Lusa Creek entering at this point. The oxygen sagged off to a value here of a little less than 5.0 immediately above the Sill. Then, as the water flowed over the Sill, it was reaerated, and it showed a slight sag going on downstream.

We were also concerned if the same load as occurred during the survey was going to the stream at a stream flow of 1500 cfs, 30° C.

The results of the computations show, for one thing, that we would expect a lower dissolved oxygen condition in the stream. The sag was much the same, but came down to a value of 2.5 mg/l. Then it was reaerated to a value of just about 5.0 mg/l, as the calculations handled the problem of reaeration. Then we would expect just a very little sag, and then start of recovery as the water flows on downstream.

You will remember we had information that Crown Zellerbach proposed to discharge 62,000 pounds of B.O.D. per day to the stream of settled wastes. For a stream flow of 1500 cfs, 30° C., we would expect that proposed load to produce a sag above the Sill down to a value of probably around 4.0. The reaeration, going over the Sill, and then a sag, the upper one of these two curves, here, going on downstream, getting down below our 5.0 mg/l objective. If those settled wastes were discharged to the stream with stream flows of 1100 cfs, 30° C., we would have about the same sag above the Sill. The reaeration would be the same, but the oxygen depletion would be considerably more on downstream to a lower value of dissolved oxygen, probably somewhere around 3.5. The actual figures are in the report.

We had a chance this spring to confirm some of these estimates of ours. Actually the Louisiana Stream Control Commission had been sampling above Pool's Bluff Sill a good deal this spring. During the week of June 13th to 20th, 1963, the flows in the Pearl River were on the order of 980 to 1060 cfs. The temperatures were from 27° to 31.5° C. We had calculated that under a stream flow of 1100 cfs, 30° C., with substantially the same load as we think there was this spring, the dissolved oxygen above the Sill would be 1.1 mg/l. The actual observed values ran from 0.8 to 3.2 mg/l, which we consider is pretty good substantiation of the calculations.

May we have Figure 12, please? We will now go over to the East Pearl River and consider some of the same parameters over there. This is the number of species per station on the East Pearl River. We found large numbers of species on the upstream stations that were relatively unpolluted on Hobolochitto Creek, but directly below the discharges from Crosby Chemicals we found a very limited number of species of undesirable nature. The stream started to recover a little bit, going down to Jackson's Landing, and then continued recovering on downstream. We had clean stream conditions at Farr's Slough and on down here.

May I have Figure 11, please? This is the mean number of organisms per square foot. We found acceptable numbers of organisms upstream on Hobolochitto Creek, and on downstream, here, we found acceptable numbers at Farr's Slough, all indications of clean streams. But down below Crosby Chemicals' discharges, we found very high numbers of undesirable organisms. The stream shows its recovery better in this slide than it did in the previous one above the old wooden bridge at Jackson's Landing; but, as a result of the discharges from the City of Picayune, we had very large numbers, up over 450 organisms per square foot, down below Picayune, indicating pollution from the raw sewage discharges of that city.

Bear in mind that when we are talking about the East Pearl here, that interstate waters commence here and continue on downstream and out into Lake Borgne.

May I have Figure 13, please? Here we have the coliform MPN/100 ml on the East Pearl River. Down here at the bottom of the chart we have a short dashed line representing our 1000 MPN/100 ml water contact objective. We have our longer dashed line here for our 5000 general recreation objective. I guess we had one station way down here on the delta, where we had an average value below our 1000 MPN water contact objective. All the rest of the stations had average values in excess of that.

Most of the stations, as you can see, with the exception of perhaps this one, this one, and these right in here -- at most of the stations the 5000 MPN objective for general recreational use of the stream was also exceeded.

Downstream from the discharges of the City of Picayune we had MPN values up around 120,000 on the average. The black bar in here for the fecal coliform MPN indicates that this waste was definitely from warm-blooded animals.

May we have Figure 16 of the report, please? This is the dissolved oxygen condition on the East Pearl during the period of the survey. At our upstream control stations, where the streams were clean and relatively unpolluted, we had values of dissolved oxygen from 6.0 to 7.0, or a little higher, and again down here, way downstream. But immediately below Crosby Chemical the oxygen was depleted to a value on the average of 2.5 mg/l, and we had some recovery here in these interstate waters.

Turn the slides off, please.

I would like to emphasize the correlation of these parameters. In the clean streams we had a large number of species of acceptable numbers and of acceptable kinds of species, that is, acceptable for fish food. We had high dissolved oxygen and low MPN.

In the polluted reaches of the stream the parameters confirmed one another. We had very few species of unacceptable kinds, large numbers of organisms per square foot; and had low dissolved oxygen and had high MPN as a result of the pollution.

On September 26, 1962, wastes discharged by Crosby Chemicals, Inc. drastically altered the stream biology. The most obvious effect was the severe destruction of fish life. The fish kill was observed downstream from Burnt Bridge to two miles below old U. S. 11 Bridge, a distance of 17 miles. The precise downstream limit is not known, but dead fish were reported at Gainesville, Mississippi. This is a total reach of 17 miles of interstate water.

In the upstream area the conditions were sufficiently severe to kill gar. Gar are believed to have survived downstream at EP-22, but game fish, bass, bluegills and crappies were killed below Station EP-22. Rough fish and forage fish, minnows, eels, flounders, mullets, catfish and suckers suffered a similar fate. Of particular interest was the destruction of several large sturgeon, eight actually being observed of about 3 to 4 feet in length.

May I have Figure 18, please? Following the observation of the effects of the unusual discharge to the East Pearl on September 26, the frequency of chemical sampling was increased. In the tabulation of the data, the two series of data are separated and considered separately. The dissolved oxygen and the C.O.D., or chemical oxygen demand data are presented in Figures 18 and 19. These figures are isometric presentations. Concentrations are plotted vertically, time is plotted across the figure, and the river miles are plotted up the figure.

In this Figure 18 the river miles of the sampling stations are indicated down along this line. This is all interstate water from this point, on down. Time is indicated across this way. Each one of these spaces here represents 24 hours. You see the dates here, running from September 21 through the 2nd of October.

These are bar charts representing the dissolved oxygen condition in the stream. This bar chart is for one station, particularly this EP-22, and you can see how the dissolved oxygen ran along pretty uniform, here, until we got into a bad situation I will talk about a little later.

We can also see from this type of chart that upstream from Crosby Chemicals the dissolved oxygen was pretty uniform all during the survey. But down below the discharges from Crosby Chemical we had a normally polluted situation here of about 2.5 mg/l. It improved a little bit, going on downstream to the mouth of Hobolochitto Creek, and then was depressed slightly by the discharges from the City of Picayune, and then showed better recovery on downstream here at EP-22.

At the time of these discharges from Crosby Chemicals, as these wastes flowed down to this sampling station, the oxygen was depleted, and it finally went to zero. A little later in time, as this slug of waste flowed on down the stream to another station just below the mouth of Hobolochitto Creek, again we had a depletion in dissolved oxygen. It went to zero for a period of time, and then recovered. At subsequent stations, EP-28 and EP-22, on down the river we had this same depletion of oxygen as this slug of waste went on down the stream.

Down here we are running into a tidal effect, and the stream velocity was much less, as indicated by this curving line.

We have chosen here to represent this travel of the slug of waste down the stream, as a path. Let me have the next one, No. 19, please. This represents the chemical oxygen demand observations on the stream, and we have the same path in order to show the correlation between the dissolved oxygen values and the chemical oxygen demand values. Up here at our control stations we had relatively low C.O.D. values. But here we had peak values which corresponded with the low dissolved oxygen conditions in the stream. We apparently had a second discharge from Crosby Chemicals, which was of considerable oxygen demand value, as indicated by this peak here, and this peak here, and this subsequent one on down here. That apparently did not have the oxygen demand that the initial discharge had.

Let me have Figure 17, please. Most of the bottom dwelling animals were also killed in the affected area. The number of kinds found at the survey stations was much reduced, as shown in this figure, the three lower stations being in interstate waters. Those organisms that survived are capable of withstanding extended periods of zero dissolved oxygen, or are capable of obtaining oxygen at the air-water interface. The destruction of bloodworms and sludgeworms at Burnt Bridge suggests the presence of an unknown toxic substance, since these worms can survive extended periods of several weeks of zero dissolved oxygen.

I will point these out to you. These black bars, here, are the condition in the stream before the discharges. These are the same values that we showed on Figure 12 a little while ago. We had a polluted condition here below Crosby Chemicals, and we had a recovery zone, going down the stream; but, after these discharges, we didn't have any organisms at the first station below Crosby Chemical, and on downstream we had even fewer numbers of species, indicating that the pollution effect was getting worse even as we went on downstream.

I would like to emphasize here the connection between severe pollution and relatively small numbers of species or kinds of organisms. Here we definitely had a severe load discharged to the stream, and, as a result the bottom conditions changed. The numbers of species were reduced to just a few very undesirable forms.

Turn the slides off, please.

I would like to summarize a little bit on some of these observations of ours.

On the lower Pearl, bottom dwelling organisms indicate that a minimum 11 miles of the Pearl River were highly degraded, from Bogue Lusa Creek to Pool's Bluff Sill, and an additional 2 miles, Coburn Creek to Bogue Lusa Creek, was degraded on the Louisiana side. The recovery stretch downstream from Pool's Bluff Sill to P-50 provides a minimum additional 13 miles of stream that was partially degraded. The total of these segments shows pollutional effects on the fisheries and wildlife for a minimum of 26 miles in interstate water.

A 1950 study on the Lower Pearl River indicated that a minimum of 43 miles of stream exhibited pollutional effects on the biota. A major factor in the reduction of the length of the polluter reaches of the stream may be the installation of the navigation sill at Pool's Bluff since the 1950 study. The impoundment caused by the construction of Pool's Bluff Sill provides for sedimentation of the fibers within the pool so that they are not distributed down a greater reach of the stream. The water spilling over the dam is effectively reaerated.

Discussions with fishermen along the river indicated that fishing was not as good in the Bogue Lusa Creek to Pool's Bluff reach of the river as in the reaches above or below this degraded area. This consensus of the fishing refers both to the quality of the fish and to the total fish caught. Utilization of nets for fish sampling operations during low flow periods in the Bogue Lusa Creek--Pool's Bluff reach of the stream was impractical because of fouling of the nets by paper fines.

An extensive kill from Bogue Lusa Creek to Walkiah Bluff occurred during the period July 15-16, 1960. This fish kill was attributed to the discharge of a tank of soap and black liquor into the Pearl River by the Bogalusa Division of the Crown Zellerbach Corporation.

The utilization of the degraded stretch of the stream for recreational purposes is limited by the extensive amount of pollution. The presence of floating and suspended solids in the vicinity of Richardson's Landing reduces utilization of this access area. The observed density of coliform bacteria throughout the entire reach of the interstate stream surveyed from Louisiana State Highway 10 to U. S. Highway 90 was in excess of 1,000 MPN/100 ml, indicating that there would be a public health hazard in using the river for water contact sports. With the exception of the two end stations at Louisiana State Highway 11 and U. S. 90, all stations showed an average total coliform density in excess of 5,000 MPN/100 ml, which is considered to be the upper limit for general recreational use of the stream.

Over on the East Pearl on Hobolochitto Creek at and above Beech Road the concentration of coliform organisms was of a magnitude to make the stream unsatisfactory for water contact sports.

Prior to the unusual waste discharges on September 26, 1962, data obtained from sampling bottom dwelling organisms indicate that in the intrastate reaches of the stream, 4.8 miles from Crosby Chemicals to Farr's Slough below Burnt Bridge, were degraded; and 2.3 miles on down to the state line were in the process of recovery. An additional one mile of interstate water may be added to the recovery zone. A total of 8.1 miles of stream were thus affected by pollution, other than that measured by density of total coliform organisms.

Under stream conditions prevailing before September 26, 1962, the interstate waters of the East Pearl River were degraded for legitimate recreational uses by relatively high coliform densities. There was a potential public health hazard for water contact sports.

As a result of the unusual discharges from Crosby Chemicals, Inc., the recovery of the fish population will undoubtedly take a few years. Some fish survived by ascending tributaries, and would re-enter the stream forming a nucleus for repopulation. Within a year or two, reproduction and immigration could reestablish a number of fish; however, many of these would be small and it would take time to grow catchable fish.

Some examples of growth rates are as follows:

Channel catfish, 8 to 16 inches long - 3 years.

Flathead catfish, 15 to 29 inches long - 6 years.

Largemouth bass, 8 to 18 inches long - 3 years.

Removal of bottom organisms reduces the rate of recovery of the fish population, since these animals are an important food supply for fishes. Many forms of bottom animals should be re-established within a year, but a longer period of time may be necessary for the development of a normal population.

The sanitary survey made by the Louisiana State Board of Health indicates that there are potential sources of pollution to the oyster-growing areas. Their survey and the survey reported here did not show any unacceptable concentrations of coliform at the beds during the survey, but additional surveys at higher flows are recommended.

Thank you.

The following is the complete "Report on Pollution of Interstate Waters of the Pearl and East Pearl Rivers, Louisiana-Mississippi," as prepared by the Robert A. Taft Sanitary Engineering Center:

PEARL RIVER SURVEY

ACKNOWLEDGEMENTS

This report on the Pearl River was prepared by John M. Fairall, Chemical Engineering Consultant.

The field study was organized and directed by A. W. West, Public Health Engineer.

Pearce Klazer, Senior Assistant Sanitary Engineer, was Assistant Project Engineer for field surveys and report preparation.

Biological studies were performed, and the biological section of this report was prepared, by L. E. Keup with J. R. Geckler under the supervision of K. M. Mackenthun, Biologists.

All work was performed under supervision of F. W. Kittrell, Engineer-in-Charge, Pollution Evaluation Unit of the Technical Advisory and Investigations Section at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

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PEARL RIVER SURVEY

INTRODUCTION

In a letter dated December 14, 1961, Dr. A. L. Gray, Executive Officer of the Mississippi State Board of Health, indicated a vital concern regarding the quality of the water of the Pearl River and requested the U. S. Public Health Service to make a water quality study of the stream.

On the basis of the requested study, this survey and other information which caused the Secretary of Health, Education and Welfare to believe that pollution of interstate waters of the Pearl River and the East Pearl River, by wastes originating in Louisiana and Mississippi, was endangering the health or welfare of persons in Louisiana and Mississippi, the Secretary called a conference to review the problem in New Orleans, Louisiana, on October 22, 1963.

BACKGROUND

PREVIOUS SURVEYS

U. S. Public Health Service

A previous survey of the Pearl River was made by the U. S. Public Health Service during late October and early November 1950.[1] This previous survey was confined to that reach of the Pearl River from the mouth of Bogue Lusa Creek to a point 43 miles downstream (River Mile 32). The East Pearl River was not involved in this survey. During the period of the survey the flow was between 2,300 and 2,900 cubic feet per second and the lowest D.O. value observed in the river was 5.5 mg/l. This maximum oxygen depletion occurred between 18 and 24 miles below the mouth of Bogue Lusa Creek (River Miles 57 and 51). During the survey it was observed that the clean water organisms had disappeared below the sources of pollution and did not reappear within 43 miles. Based on the observed loading the minimum D.O. expected to occur on an average of once in ten years, at 1,250 cubic feet per second and 28° C, was 0.4 ppm approximately 0.3 days flow time below the mouth of Bogue Lusa Creek.

Louisiana

During the period of March 1961 to August 1962, the Division of Water Pollution Control of the Louisiana Wildlife and Fisheries Commission conducted a number of surveys on the Pearl River, from Bogue Lusa Creek to Walkiah Bluff, covering substantially the same problem and streams discussed in the 1950 U. S. Public Health Service report. The results of these Louisiana surveys were reported in August, 1962.[2]

Low values of D.O. were observed at a point 9 miles below Bogue Lusa Creek (Pool's Bluff, P-64) and again approximately 20 to 25 miles below Bogue Lusa Creek (P-55 and P-50). A minimum D.O. of 3.8 mg/l was observed at Pool's Bluff with a stream flow of 2,200 cubic feet per second. "Very susceptible clean water benthic forms" were eliminated from Bogue Lusa Creek to Walkiah Bluff." "... Moderately tolerant benthic forms . . ." were eliminated from Bogue Lusa Creek to 8 - 10 miles below Pool' Bluff and ". . . absolute and relative abundance of highly tolerant benthic forms . . . " increased in the same reach.

From March 1961 to August 1962, fourteen grab samples were collected from the east and west sewers of the Crown Zellerbach integrated kraft mill at Bogalusa. The rate of discharge of wastes, expressed as pounds of biological chemical demand per day, varied from 26,901 to 129,923 pounds per day with an average value of 76,167.[2]

An addendum to the report was issued in October 1962.[3] Among other information this addendum indicated that the Bogalusa Division of the Crown Zellerbach Corporation had a pending application (before the Stream Control Commission) for discharging primary treated wastes from the production of 1500 tons of paper per day, containing 62,000 pounds per day of B.O.D.

In October, 1962, the Louisiana State Board of Health issued a report "Louisiana Oyster Water Survey, 1962, Pearl River-Mississippi Sound."[4] A sanitary survey of the Louisiana waters indicated that the most likely sources of pollution potentially affecting the oyster harvesting areas appeared to be:

1. Discharge from several distributaries of the Pearl River
2. Flow from Lake Borgne into the Sound
3. Under certain wind and tidal conditions, the discharge from the Jordan and Wolf Rivers in Mississippi

"Other possible sources of contamination are storm flow and untreated or partially treated sewage from the heavily populated coastal strip extending from St. Louis Bay to Biloxi, and the sewage discharge from vessels operating in the vicinity (the Intercoastal Waterway traverses the waters in question and carries a fairly heavy traffic)."

A sampling program, including the likely sources of pollution was commenced in December, 1961, and concluded in July, 1962. The waters of the Sound were sampled on three dates in August and September, 1962, following very low stages on the Pearl River. It was concluded that the water quality of the Mississippi Sound was not adversely affected, and "that the oyster-growing waters are of excellent quality from the public health viewpoint and are judged to comply with the most stringent provisions and conditions set out in the U. S. Public Health Service publication 'Sanitary Control of the Shellfish Industry' and should, therefore, be classified as 'Approved'."[4]

It was recommended that the report be supplemented by data to be collected when practicable during medium and high river stages, when bacteria from upstream sources of pollution might be carried out to the oyster beds.

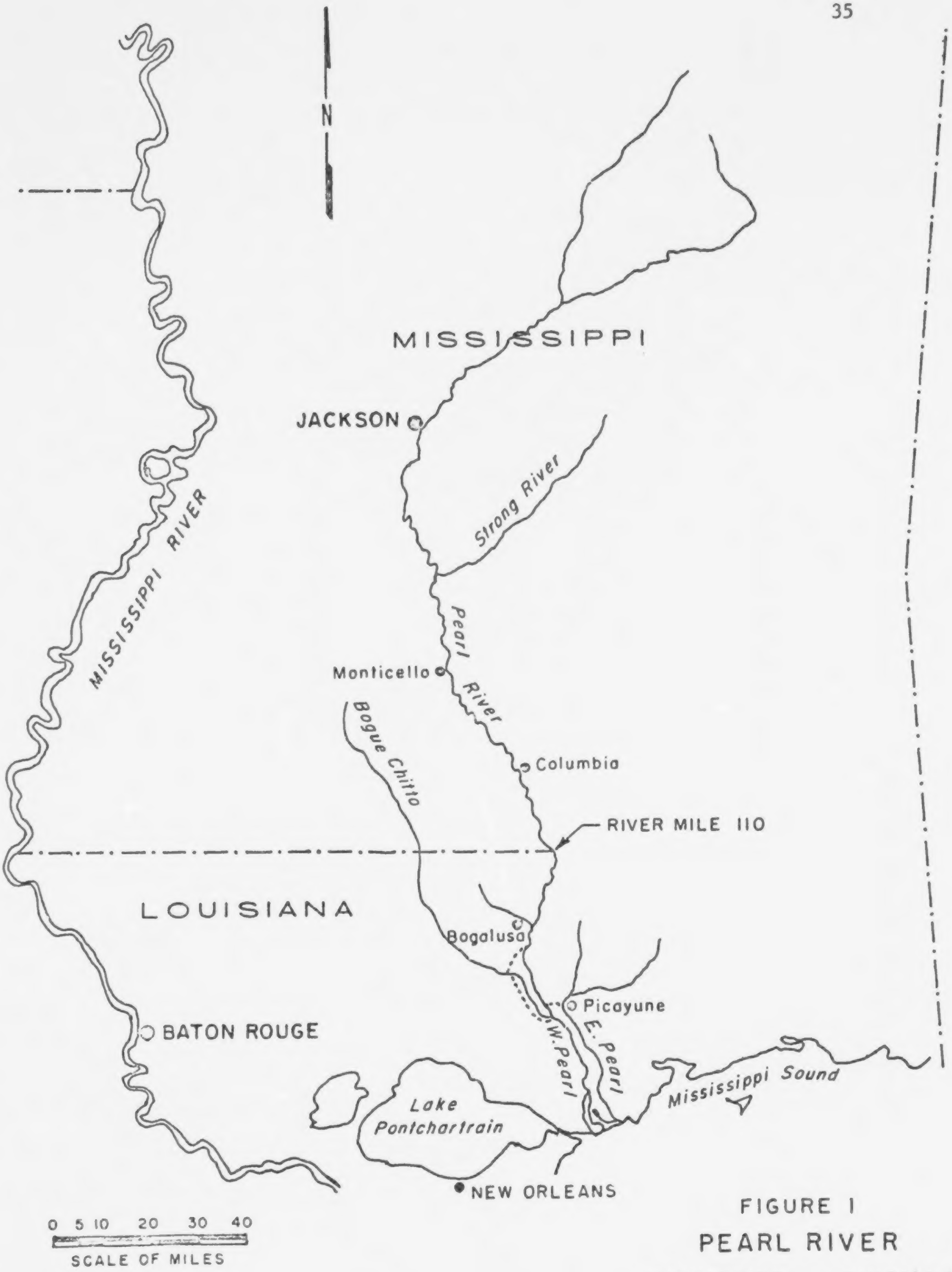
PRESENT SURVEY

This survey and report are made in response to the request by Dr. Gray of the Mississippi State Board of Health. The principal period of sampling was from September 11 to October 2, 1962. U. S. Public Health Service personnel collected samples on the East Pearl River from U. S. 90 to above Picayune, Mississippi, and on the Lower Pearl from U. S. 90 to the drawbridge across the Pearl River above the mouth of the Bogue Lusa Creek at Louisiana State Highway 10. All of these samples were analyzed at the U. S. Public Health Service trailer laboratory at Bogalusa, Louisiana, or else preserved and returned to Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Samples collected on the Pearl River downstream from U. S. 90 and out into the salt water area were collected and analyzed by the Mississippi State Board of Health laboratory at Gulfport, Mississippi.

The Pearl River System is shown in Figure 1. For the purposes of this report the Pearl River System may be divided into three reaches or divisions; the Upper Pearl, the Lower Pearl which includes the West Pearl and the East Pearl. The principal part of this report is limited to the interstate waters of the Lower Pearl and the East Pearl, forming the boundary between Mississippi and Louisiana. The Upper Pearl is considered in a supplementary report bound in the Appendix.

THE LOWER PEARL

The drawbridge for Louisiana State Highway No. 10 at Bogalusa and the ramp for unloading barges at Richardson's Landing are the upstream signs of the navigable Lower Pearl, shown on Figure 2. Bogue Lusa Creek and Coburn Creek flow through the City of Bogalusa and discharge to the Pearl River above Richardson's Landing. At Pool's Bluff a sill or low-head dam has been constructed since 1950 to maintain the pool level and divert flow into the barge canal. At the time of this survey all of the flow was discharging over the dam. The barge canal is seldom used even though it extends from Pool's Bluff to the mouth of Holmes Bayou. The water flowing over Pool's Bluff Sill continues downstream to Wilson's Slough where part of the flow is diverted to the West Pearl and the balance continues past Walkiah Bluff to the head of Holmes Bayou. (During high stream flows part of the river is diverted to the East Pearl.) During the survey there was no flow from the Pearl River across to the East Pearl. Stream flow reaching Holmes Bayou passes on towards the mouth of the Bayou to join the small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JACKSON
Strong River
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Pearl River
Monticello
Bogue Chitto
Columbia
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E. Pearl
Mississippi Sound
Lake Pontchartrain
NEW ORLEANS
0 5 10 20 30 40
SCALE OF MILES

FIGURE 1
PEARL RIVER
MISSISSIPPI – LOUISIANA

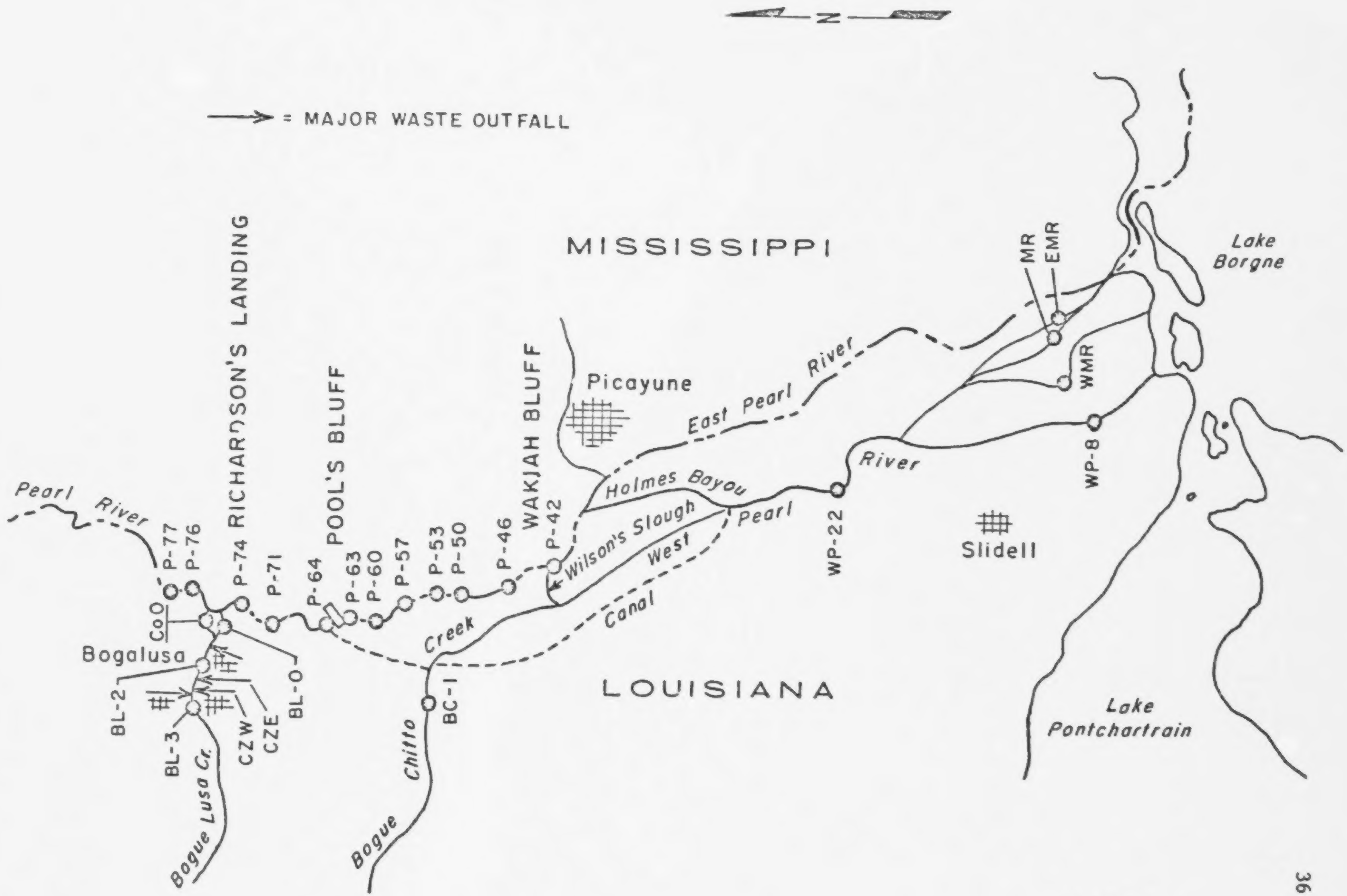
N
→ = MAJOR WASTE OUTFALL
MISSISSIPPI
LOUISIANA
Lake Borgne
Lake Pontchartrain
Picayune
Slidell
Bogalusa
Pearl River
East Pearl River
Holmes Bayou
Wilson's Slough
West Pearl River
Canal
Creek
Bogue Chitto
Bogue Lusa Cr.
RICHARDSON'S LANDING
POOL'S BLUFF
WAKJAH BLUFF
MR
EMR
WMR
WP-8
WP-22
P-42
P-46
P-50
P-53
P-57
P-60
P-63
P-64
P-71
P-74
P-76
P-77
CoO
BL-O
BL-2
BL-3
CZW
CZE
BC-1

FIGURE 2

SAMPLING STATIONS
LOWER PEARL RIVER
MISSISSIPPI – LOUISIANA

flow, diverted at Wilson's Slough, at the lower end of the locks and dam of the barge canal. Between Wilson's Slough and the mouth of Holmes Bayou the principal tributary, Bogue Chitto, is introduced from the west. The navigable West Pearl continues to the Rigolets and Little Lake and tidewater.

The interstate waters of the Lower Pearl extend from the Louisiana-Mississippi state line, P-110, to the head of Holmes Bayou, P-40.

In the delta of the Pearl River System there are three rivers between the East Pearl and the West Pearl as shown on Figure 2. These are the East Middle, Middle, and the West Middle Rivers. These rivers are within the tidal effect of the Gulf, and there did not appear to be any appreciable flow in them at the time of the survey.

THE EAST PEARL

The East Pearl River is a separate drainage system lying on the eastern edge of the Pearl River Delta as shown in Figure 3. Prior to 1850, the East Pearl was a distributary of the Pearl River Delta System.[1] About 1850, several man-influenced factors separated this distributary from the main Pearl System.

Two streams, the Hobolochitto and West Hobolochitto, form the upper watershed. The West Hobolochitto joins the Hobolochitto at Picayune, Mississippi (River Mile H-7.5). Farr's Slough joins Hobolochitto Creek 5.2 miles further downstream (H-2.3) and is believed to be the principal

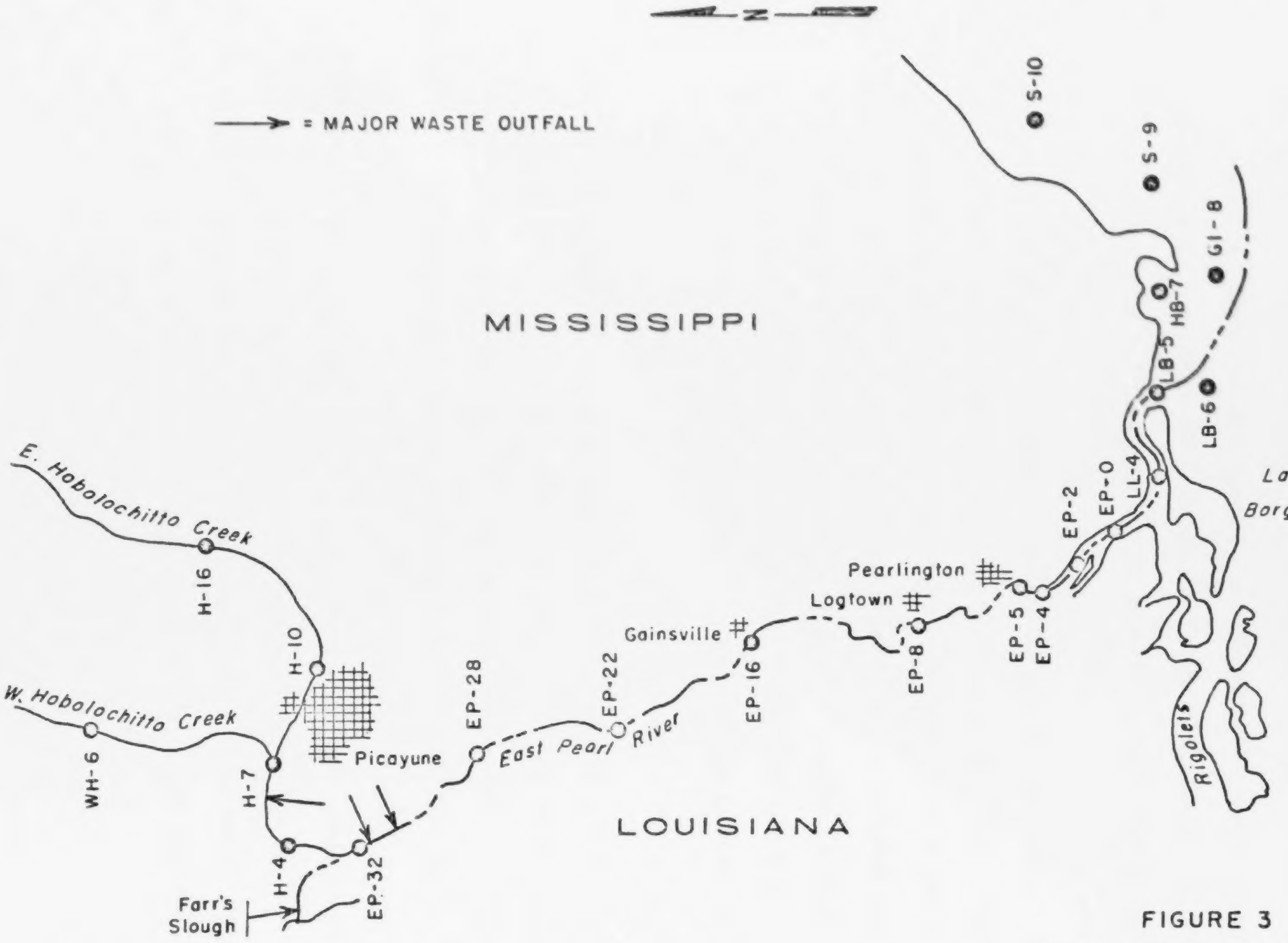
= MAJOR WASTE OUTFALL
N
MISSISSIPPI
LOUISIANA
S-10
S-9
GI-8
HB-7
LB-5
LB-6
Lake Borgne
LL-4
EP-0
EP-2
Rigolets
Pearlington
Logtown
EP-5
EP-4
EP-8
Gainsville
EP-16
EP-22
East Pearl River
EP-28
Picayune
H-10
E. Hobolochitto Creek
H-16
W. Hobolochitto Creek
WH-6
H-7
H-4
EP-32
Farr's Slough

FIGURE 3

SAMPLING STATIONS
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

channel carrying high stream flows from the Pearl River to the East Pearl. Hobolochitto Creek becomes the East Pearl River (H-0.0 or EP-33.1) when the river channel joins the State boundary.

The interstate waters of the East Pearl River extend from the mouth of Hobolochitto Creek, H-0.0 or EP-33.1, to tide water, EP-0.0.

SALT WATER

The salt water area considered in this report extends from the Rigolets to Waveland, Mississippi, and includes part of Mississippi Sound, Grass Island, Grand Island, and LePetit Pass Island. Lake Pontchartrain and the Pearl Rivers contribute fresh-water flow to the area.

WATER USES

WATER SUPPLY

The Bogalusa Division of Crown Zellerbach Corporation takes part of its industrial water supply from Bogue Lusa Creek, and Crosby Chemical Corporation takes water from Hobolochitto Creek. The National Aeronautical and Space Administration will be taking cooling water from the East Pearl River for the Mississippi Test Facility in the future.

RECREATION

The Pearl River System is used throughout its length as a fishing stream. Some of the Lower Pearl is a wilderness stream and may be used more extensively as population densities increase and conveniently located boat landings are provided. The area immediately above the Sill is utilized to some extent. Some sport fishermen fish directly in the Pearl River and use the river as a waterway to tributaries and flood plain lakes. Sport fishing activity in the spillway, immediately below the Sill, is popular. Water skiing is primarily confined to the barge canal although the pool immediately above the Sill is utilized as a turning basin while skiing.

STOCK WATERING

Dairy cattle are excluded from the rivers and watered at farm ponds and from wells. Some stock cattle are allowed to graze in the woods of the river bottoms and have access to the stream particularly in the upper reaches where the forest is not so heavy.

NAVIGATION

The salt water area is traversed by the Intercoastal Waterway from the Grand Island Channel through Grand Island past Pearl River Light to the Rigolets. The barge canal on the Pearl River from Holmes Bayou to Pool's Bluff provides a potential navigational use of the stream.

SHELL FISHING

"The oyster-producing areas of the (Mississippi) Sound are primarily located near the previously mentioned islands and the islands forming the southern boundary of the Sound. Due to lack of highways and roads in the area, the Sound is seldom fished by Louisiana oystermen; however, the area is accessible by boat from the Mississippi coast west of Biloxi and, therefore, is used by oystermen from this area. Oysters harvested in the (Louisiana) area by out-of-state fishermen are taxed by the State of Louisiana . . .

"Mississippi Sound west of Biloxi, Mississippi, is open for oyster harvesting during certain periods of the year."[5] The harvest in Louisiana waters was 33,000 barrels in the 1960-1961 season.[4]

SOURCES OF WASTES

MUNICIPAL

The City of Bogalusa (sewered population 21,000) discharges untreated sewage to Bogue Lusa Creek at three different points. Between Cumberland Street and Columbia Street on the north bank a primary sewage treatment plant with separate sludge digestion, and pre- and postchlorination, is under construction. This sewage treatment plant will serve approximately two-thirds of the population. At the time of this survey raw sewage was being discharged to the creek. Sewers for that part of the city, south of Bogue Lusa Creek and east of the railroad tracks, serving the paper mill, discharge to the stream at two points below Columbia Street bridge. At high stream flows part of these wastes reach the Pearl River through Coburn Creek rather than directly through Bogue Lusa Creek.

At Picayune, Mississippi, a sewered population of approximately 430 people, residing north of East Hobolochitto Creek, is served by a sewer system discharging to a waste stabilization pond. Any overflow from this pond discharges to East Hobolochitto Creek upstream from U. S. Highway 11. The balance of the public sewer system, serving approximately 6,000 people, drains to a pumping station in the southwest part of the town which discharges the raw sewage to the East Pearl River, below the mouth of Hobolochitto Creek and west of Nicholson, Mississippi.

Other communities on the banks of the river are not known to have public sewer systems.

INDUSTRIAL WASTES

At Bogalusa, Louisiana, the Crown Zellerbach Corporation operates an integrated kraft sulphate pulp and paper mill. Current production is 825 tons per day of the sulphate pulp, 110 tons per day of neutral sulfite semi-chemical pulp, 115 tons per day of secondary paper pulp, and occasionally up to 160 tons per day of bleached pulp. Waste waters from these operations, with a population equivalent of about 250,000 people, are discharged to Bogue Lusa Creek at two points opposite the new municipal sewage treatment plant. A chemical by-product plant which produces dimethyl sulfide and dimethyl sulfoxide was not operating at the time of the survey.

At Picayune, Mississippi, there are three sources of industrial wastes: Crosby Forest Products, which impregnates lumber products with creosote, and a dairy discharge wastes to the storm sewer canal in the southern part of the town, which drains southwestward beyond the city limits to a natural watercourse or branch, eventually discharging to the East Pearl downstream from the municipal sewage outlet. The third source of industrial waste, Crosby Chemicals, Inc., processes crude tall oil and crude sulphate turpentine, and chemical specialties, some of which contain zinc. The wastes from the tall oil operations discharge to a pond with provisions for skimming. These Crosby Chemical wastes are discharged to Hobolochitto Creek downstream from Beech Road.

PRESENTATION OF DATA

GENERAL

Tabulated chemical and bacteriological data are presented in Appendix A starting with Table A-6, and tabulated biological data are presented in Appendix B. Summarized data are presented in this section of the report in various graphical forms.

Sampling stations occupied during this survey for the collection of chemical and bacteriological data are listed in Table 1. Stations occupied for the collection of biological samples and observations are at these same stations or intermediate points.

A summary of stream flow data is presented in Table 2. Stream flows were reasonably uniform during the period of sampling. The stream flows were well below the average flows for the rivers involved, but exceeded the minimum stream flows of record.

LOWER PEARL RIVER

The principal sources of waste on the Lower Pearl are the pulp and paper mill and the raw municipal sewage at Bogalusa. These waste streams are discharged to Bogue Lusa Creek, which in turn discharges to the Pearl River either directly or through Coburn Creek, depending on the stream flow and the braided channels at the mouths of these two creeks.

PEARL RIVER SURVEY - MISSISSIPPI-LOUISIANA

TABLE NO.1

SAMPLING STATIONS FOR CHEMICAL AND BACTERIOLOGICAL SAMPLES

STATION NUMBER	RIVER MILES	LOCATION	TYPE OF SAMPLE	IMMEDIATE UPSTREAM WASTE
		BOGUE LUSA CREEK (River Mile 74)		
BL3	3.1	Foot bridge upstream from paper mill discharges	Bridge	None
CZW		West sewer, Crown Zellerbach Corp.	Grab	
CZE		East sewer, Crown Zellerbach Corp.	Grab	
BL2	2.5	Columbia St. bridge		Crown Zellerbach & 2/3 City of Bogalusa
BL0	0.1	Mouth of Bogue Lusa Creek	Boat	
		COBURN CREEK (River Mile 75)		
CO0	0.1	Mouth of Coburn Creek	Boat	
		LOWER PEARL RIVER		
P77	77.0	Drawbridge on Louisiana State Hy.10		None
P76	75.5		Boat	None
P74	73.5	Richardson's Landing	Boat	Coburn Creek and Bogue Lusa Creek
P71	70.8		Boat	
P64	63.5	Above Pool's Bluff Sill	Boat	
P63	63.2	Below Pool's Bluff Sill	Boat	
P60	60		Boat	
P57	56.7		Boat	
P53	53.5		Boat	
P50	50.5		Boat	
P49	48.5		Boat	
P46	46.5		Boat	
P42	42.2	Lower Walkiah Bluff	Boat	
WP22	22.0	Old U.S.11 bridge over West Pearl River	Bridge	
WP8	7.8	U.S.90 bridge, 3' below surface of river	Bridge	
BC1		Bridge on Louisiana State Hwy.7 over Bogue Chitto Creek	Bridge	
WMR		U.S.90 bridge over West Middle River	Bridge	
MR		U.S.90 bridge over Middle River	Bridge	
EMR		U.S.90 bridge over East Middle River	Bridge	

PEARL RIVER SURVEY - MISSISSIPPI-LOUISIANA

TABLE NO. 1

SAMPLING STATIONS FOR CHEMICAL AND BACTERIOLOGICAL SAMPLES
(Continued)

STATION NUMBER	RIVER MILES	LOCATION	TYPE OF SAMPLE	IMMEDIATE UPSTREAM WASTE
		HOBOLOCHITTO CREEK (River Mile 33.1)		
H16	15.7	Bridge on road to Union Baptist Church, E. of Caesar, Miss.	Bridge	None
H7	7.1	Beech Road bridge, Picayune, Miss.	Bridge	Virtually none
H4	3.9	Burnt Bridge W. of Picayune, Miss. on Palestine Road	Bridge	Crosby Chemical
		EAST PEARL RIVER		
EP32	32.1	Logging road bridge at Jackson's Landing, W. of Nicholson, Miss.	Bridge	Crosby Chemical
EP28	28.4	New U.S.11 bridge over East Pearl, S. of Nicholson, Miss.	Bridge	City of Picayune and storm water canal
EP22	21.8	Old U.S.11 bridge over East Pearl River, Santa Rosa, Miss.	Bridge	
EP16	16.5	Dock at Pearl River Marina, Gainesville, Miss.		
EP8	8.5	Stream gage, Logtown, Miss.		
EP5	5.0	U.S.90 bridge over East Pearl River	Bridge	
EP4	4.0	Downstream from U.S.90 bridge	Boat	
EP2	2.0	About 3 miles downstream from U.S.90	Boat	
EP0	0.0	Confluence of Old Pearl and East Pearl Rivers	Boat	
LL4		Mouth of Little Lake Pass	Boat	
LB5		Confluence of East Pearl River and Lake Borgne	Boat	
LB6		Near Pearl River Light	Boat	
		MISSISSIPPI SOUND		
HB7		Heron Bay	Boat	
G18		Grand Island Pass, Grassy Is.	Boat	
S9		St. Joseph Pt.	Boat	
S10		Off Bayou Caddy	Boat	

PEARL RIVER SURVEY - MISSISSIPPI-LOUISIANA

TABLE NO. 2

STREAM FLOWS IN CUBIC FEET PER SECOND

Gaging Station	Avg. Daily	Min. of Record	Sept. 11 - 30, 1962 Avg.	Min.	Max.
PEARL RIVER					
Jackson, Miss.	3786	78	232	141	364
Monticello, Miss.	6188	289	580	458	839
Columbia, Miss.	7375	705	1099	858	1520
Bogalusa, La.	8909	1100	1947	1700	2310
Pearl River, La.	-	-	2925	2370	3440
BOGUE LUSA CREEK					
Bogalusa, La.	-	-	41	31	88
HOBOLOCHITTO CREEK					
Picayune, Miss. (below)	-	-	70	52	92
EAST PEARL RIVER					
Nicholson, Miss.	-	-	132	120	179

Bogue Lusa and Coburn Creek

The sampling stations occupied on these creeks are shown on Figure 2. For September 10 through 30, 1962, the Bogalusa Division of the Crown Zellerbach Corporation collected, and analyzed, 24-hour composite samples at the Parshall flumes on the east sewer (CZE) and the west sewer (CZW). The flows, B.O.D., and pulp losses (fiber) are reproduced in Table A26 in Appendix A, and are summarized in Table 3 below:

TABLE 3

SUMMARY OF CROWN ZELLERBACH DATA

	Total Flow, MGD	B.O.D. lbs/day	Pulp Losses, lbs./day
Mean	25.8	53,000	45,050
Range*	7.6	46,100	53,700
No. of Samples	21	20	21

* Range is the difference between the largest observed value and the smallest observed value. The standard deviation may be estimated from the range and is a function of the number of samples. For 20 daily composite samples of B.O.D. with a mean value of 53,000 and a range of 46,100, the standard deviation is (0.268) (46,100) = 12,400. If sufficient daily composites are taken in order to include 95% of the probable values, values up to (3) (12400) + 53,000 = 90,200 may be expected.

For the period September 17 to 29, 1962, the U. S. Public Health Service survey party obtained random grab samples from the two sewers once a day and the pulp and paper mill furnished the instantaneous flow data at the time of sampling. These data are summarized in Table 4 below:

TABLE 4

SUMMARY OF PUBLIC HEALTH SERVICE DATA
(Crown Zellerbach Sewers)

	Flow Rate, MGD	B.O.D. Rate, lbs./day
Mean	41.9	41,600
Range	36.0	43,400
No. of Samples	12	12

For the period September 13 to 29, 1962, the B.O.D. being discharged from the mouth of Bogue Lusa Creek (BLO) averaged 34,200 pounds per day.

Biological Investigations

The numerical results for the biological investigations are summarized in Figures 4 and 5. Bottom dwelling animals have been selected to indicate stream bottom conditions because their response to pollution is pronounced; their length of life cycle is sufficiently long, preventing a sudden response to intermittent relief from pollutional conditions; they are incapable of making extended rapid migration, so that the influence of neighboring water conditions is reduced; and they reflect the bottom conditions at a sampling point for an extended period of time. In examining Figures 4 and 5, it should

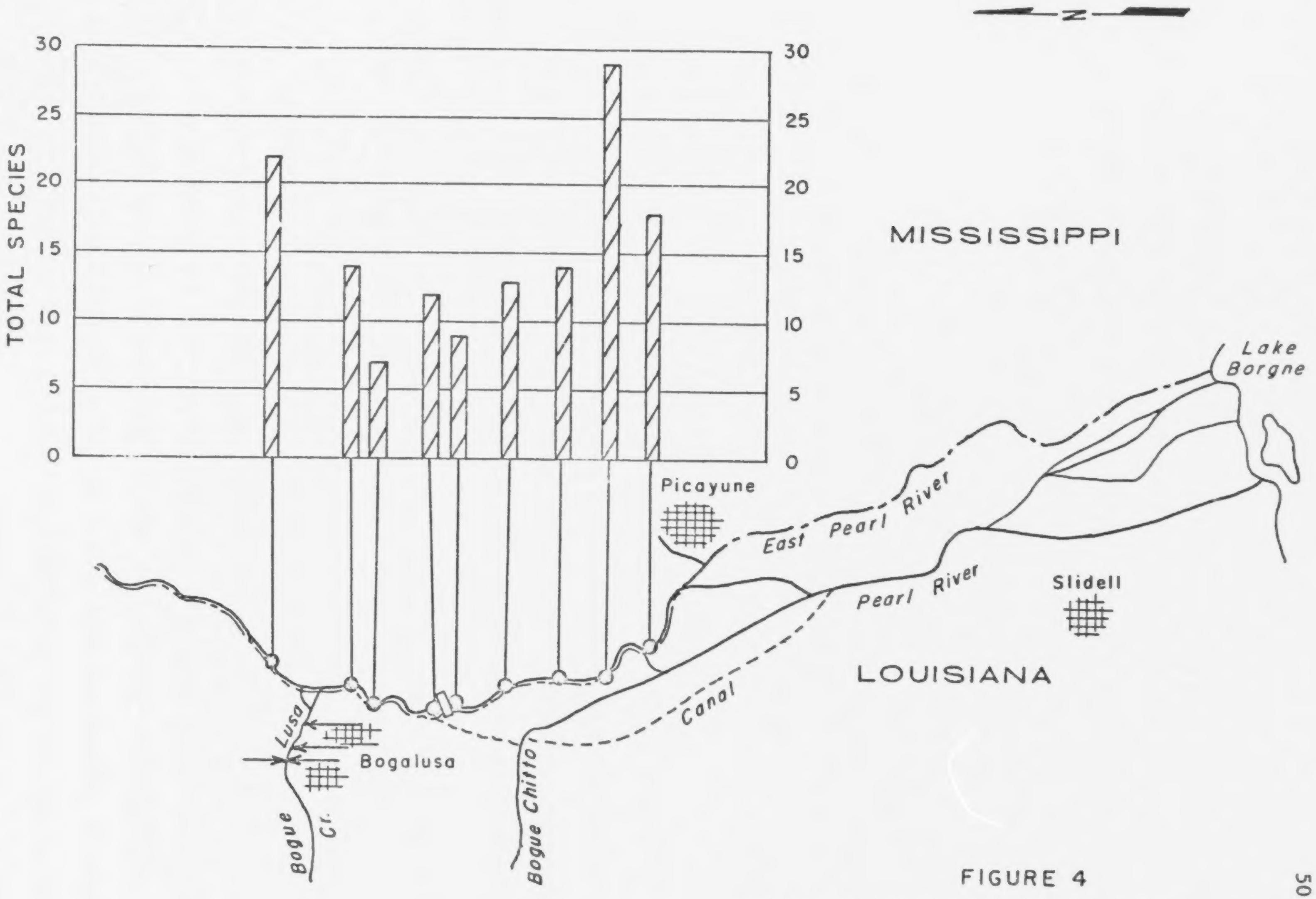

FIGURE 4

SPECIES OF ORGANISMS PER STATION
LOWER PEARL RIVER
MISSISSIPPI – LOUISIANA

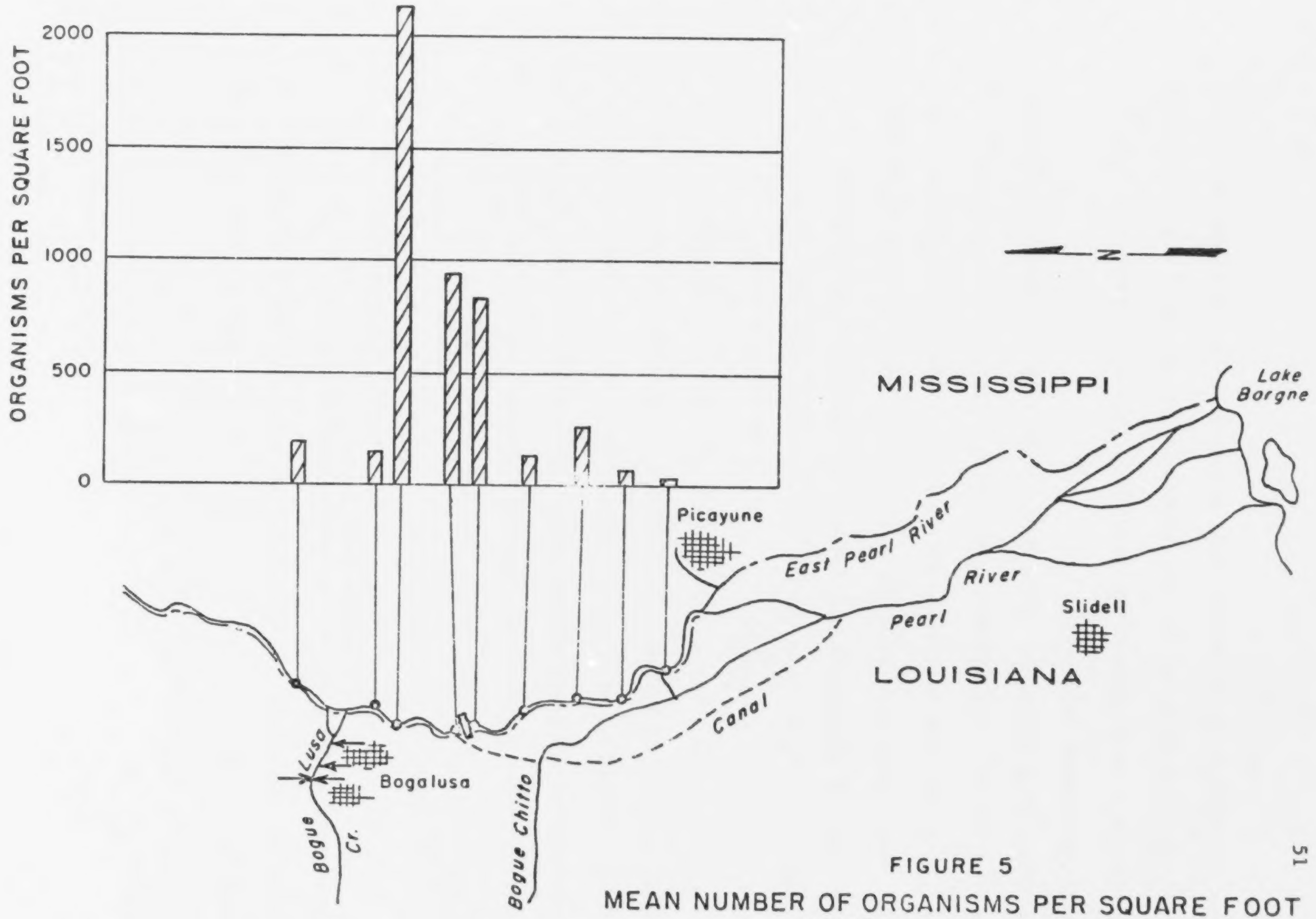

FIGURE 5

MEAN NUMBER OF ORGANISMS PER SQUARE FOOT
LOWER PEARL RIVER
MISSISSIPPI – LOUISIANA

be borne in mind that a relatively small number of bottom-dwelling organisms composing a large variety of species (kinds) is indicative of a clean stream, and conversely, a large population represented by few different kinds is indicative of organic pollution.

Coburn Creek exhibited little flow at the time of sampling. Floating solids were obvious. The bottom was covered by organic material (some digested, some raw wood materials) and bubbling of decomposition gases was obvious. Wood fibers were observed in microscopic examination of collected samples. Only one sludgeworm was found near the mouth of Coburn Creek indicating conditions to be so severe that tolerant organisms could not establish or maintain themselves.

Bogue Lusa Creek had a discharge of about 50 cfs. The water was distinctly colored, odoriferous, and carried a large quantity of suspended wood fiber. Digested sludge was not evident on the bottom; however, freshly deposited wood remains, composed of chips, bark and fibers, were noted. A sludge bank, formed at the mouth, was covered with a matted "fiberboard" where the recently deposited wood fibers had been exposed to dry. No organisms were found in the mouth of Bogue Lusa Creek.

The uppermost station (P-77.3), upstream from the drawbridge for Louisiana State Highway No. 10, is located above the sources of pollution from Bogalusa, Louisiana. At this station a great variety of bottom-dwelling organisms was found (Fig. 4 and Table B1) including forms known to be sensitive to pollutants. (For example: immature mayflies, immature caddisflies, and clams.)

On the Lower Pearl River between the inflows from Coburn and Bogue Lusa Creeks, (P-74) quantitative data (Table B 2) indicate the disappearance of sensitive forms (immature mayflies and caddisflies) in the stream channel. Qualitative data (Table B 1) show two distinct stream zones: The Louisiana bank of the river supported two forms of pollutional-tolerant bloodworm larvae, and the Mississippi bank supported a much more diverse population of bottom organisms (Table B 1) including immature mayflies and caddisflies and clams. This dramatic difference between opposite sides of the stream shows that the majority of the wastes from Coburn Creek were following along the Louisiana bank before becoming mixed with the water of the Pearl River.

At Richardson's Landing (P-74), a short distance below the confluence of Bogue Lusa Creek, large quantities of floating solids were observed on the Pearl. The bubbling of gases indicated the presence of heavy organic loads.

Three miles below the mouth of Bogue Lusa Creek (P-71) the number of sludgeworms was 12 times as great as the upstream control station (P-77), and just above Pool's Bluff Sill (P-64) the number of sludge worms was 5 times as great as that found at the upstream control station. These worms were found in great numbers only where river currents allowed deposition of organic solids. Where velocities were sufficient to keep the solids in suspension, organisms were not found in large quantities on the bottom. For example, a short distance below Pool's Bluff Sill (P-63) a pool along the bank collected organic solids and supported a population of 2,340 worms per square foot; the middle of the stream supported 28 worms per square foot of bottom; the opposite bank, swept clear of organics, supported no worms.

Samples from stations 7 miles (P-57) and 13 miles (P-50) below Pool's Bluff Sill showed signs of beginning recovery; the number of sludgeworms was reduced to a level comparable with the control station (P-77) and the numbers of kinds of bottom organisms were increasing (Table B 1). The sporadic reoccurrence of sensitive forms such as clams and immature mayflies, found at the control station, also indicates the beginning of improvement of water quality.

Seventeen miles (P-46) below Pool's Bluff Sill the community of bottom organism was indicative of stream recovery. The kinds of bottom organisms were diverse and tolerant organisms were no longer the predominant type in the community structure. The general low production of organisms just below lower Walkiah Bluff (P-42) is a result of physical environment; the river is shallower and more channelized resulting in swifter currents that shift bottom sands and gravels.

The navigation canal that is diverted from the Pearl River at Pool's Bluff Sill exhibited a clean water group of organisms a short distance down the canal from the Sill. This water exhibited no flow; thus, the pollutional load did not appreciably affect the canal, but instead was carried by the main river. The navigational canal produced specimens of large clams. These clams were strikingly absent in the degraded water reaches of the Lower Pearl River. Specimens of clams reappeared sporadically in the downstream recovery zone.

Coliform Bacteria

Coliform bacteria were determined as an indicator of probable presence of pathogenic or disease-bearing bacteria and viruses and recorded as coliform density in terms of most probable number (MPN) per 100 ml. A more specific indicator of bacteriological pollution involves bacteria specifically of fecal origin and is expressed in terms of MPN of fecal coliform per 100 ml. In the tables in Appendix A this is tabulated as E. Coli. For water contact sports it is generally accepted by public health authorities that the coliform density should not exceed 1,000 MPN/100 ml and for general recreational use and surface water supplies where water treatment plants are in use, it is generally accepted by the same authorities that the coliform density should not exceed 5,000 MPN/100 ml. These data are summarized in Figure 6.

For both of the control stations (P77 and P76) above the mouth of Bogue Lusa Creek the average coliform density was in excess of that recommended for water contact sports, At the drawbridge on Louisiana State Highway 10 (P77) the average coliform density of 3255 MPN/100 ml was satisfactory for general recreational use, however the other control station about a mile and a half down stream with an MPN/100 ml of 7983 was unsatisfactory for general recreational use. The coliform organisms discharged from the two creeks showed some expected growth in the river (to a value of 167,600 MPN/100 ml) and die off, but the coliform density was not low enough in any of the samples collected from Bogue Lusa Creek to Walkiah Bluff to be satisfactory for recreational use. In the accessible part of the interstate waters from below the creeks to Walkiah Bluff the

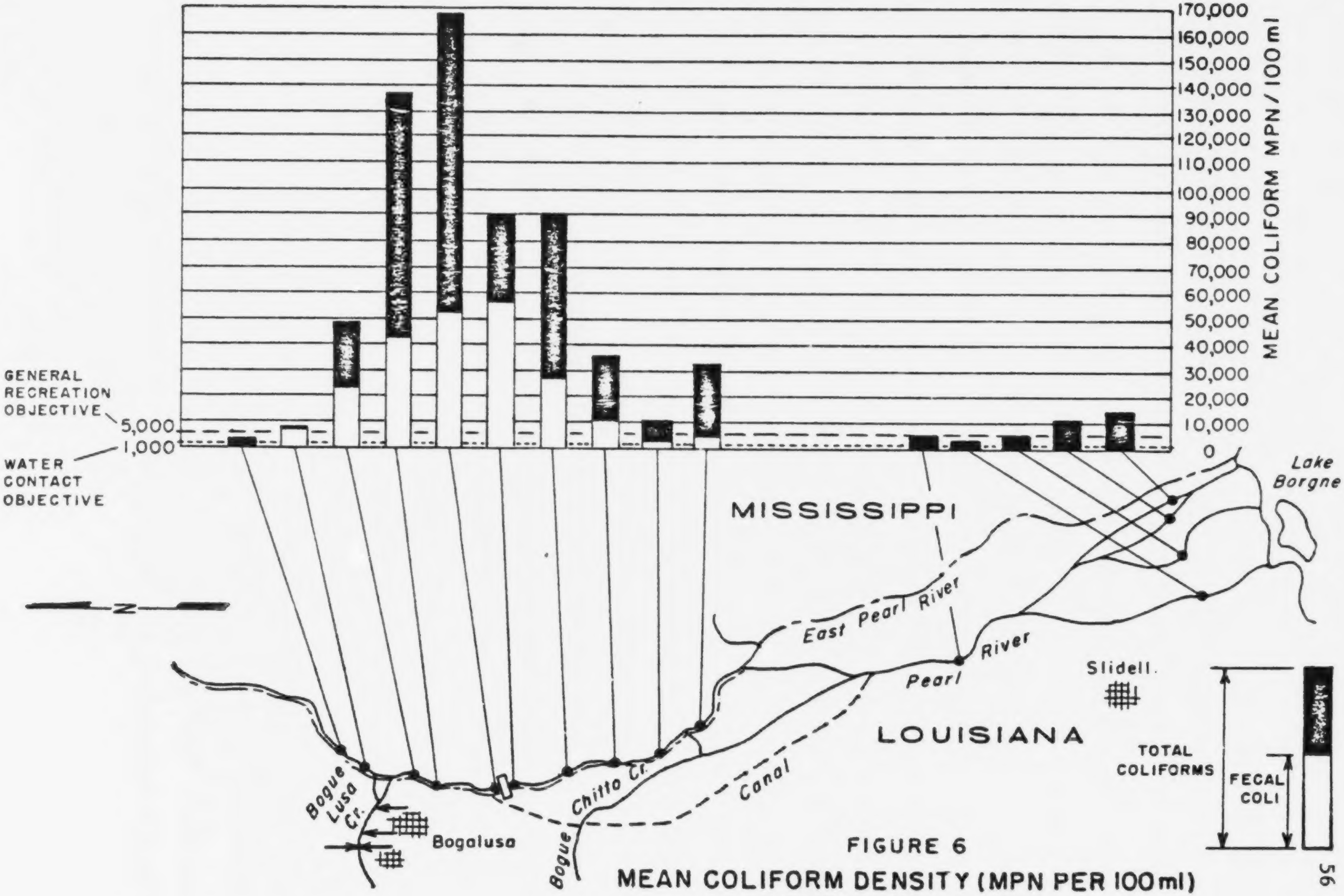

FIGURE 6
MEAN COLIFORM DENSITY (MPN PER 100 ml)
LOWER PEARL RIVER
MISSISSIPPI – LOUISIANA

stream is so heavily polluted that it is unfit for water contact sports.

The Bogue Chitto did not carry any great amount of pollution during the period of the survey.

Biochemical Oxygen Demand

The concentration or amount of organic pollutional material being discharged in the stream or measured in the stream is expressed as 5-day B.O.D. (biochemical oxygen demand) and is generally referred to simply as B.O.D. in this report. The observed concentration of B.O.D. in the Lower Pearl River during the period of the survey is summarized in Figure 7. The average concentration of B.O.D. at the individual sampling stations is shown as a heavy bar on the figure, and the maximum value for a single sample is shown as an unshaded bar. At the control stations on the Pearl River above the mouth of Bogue Lusa Creek the average concentration of B.O.D. was 1.9 and 1.8 mg/l for the two stations. Approximately four miles downstream from the discharges from Bogue Lusa and Coburn Creeks (P71), the average concentration of B.O.D. was 5.7 mg/l. From this location to Lower Walkiah Bluff (P42) the concentration gradually diminished to a value of 3 mg/l. Farther down stream at old U.S. Highway 11 and U.S. 90 the concentration of B.O.D. had been further reduced to 1.8 mg/l. B.O.D. data will be evaluated again but in a slightly different manner further on in this report when the oxygen sag curve is discussed.

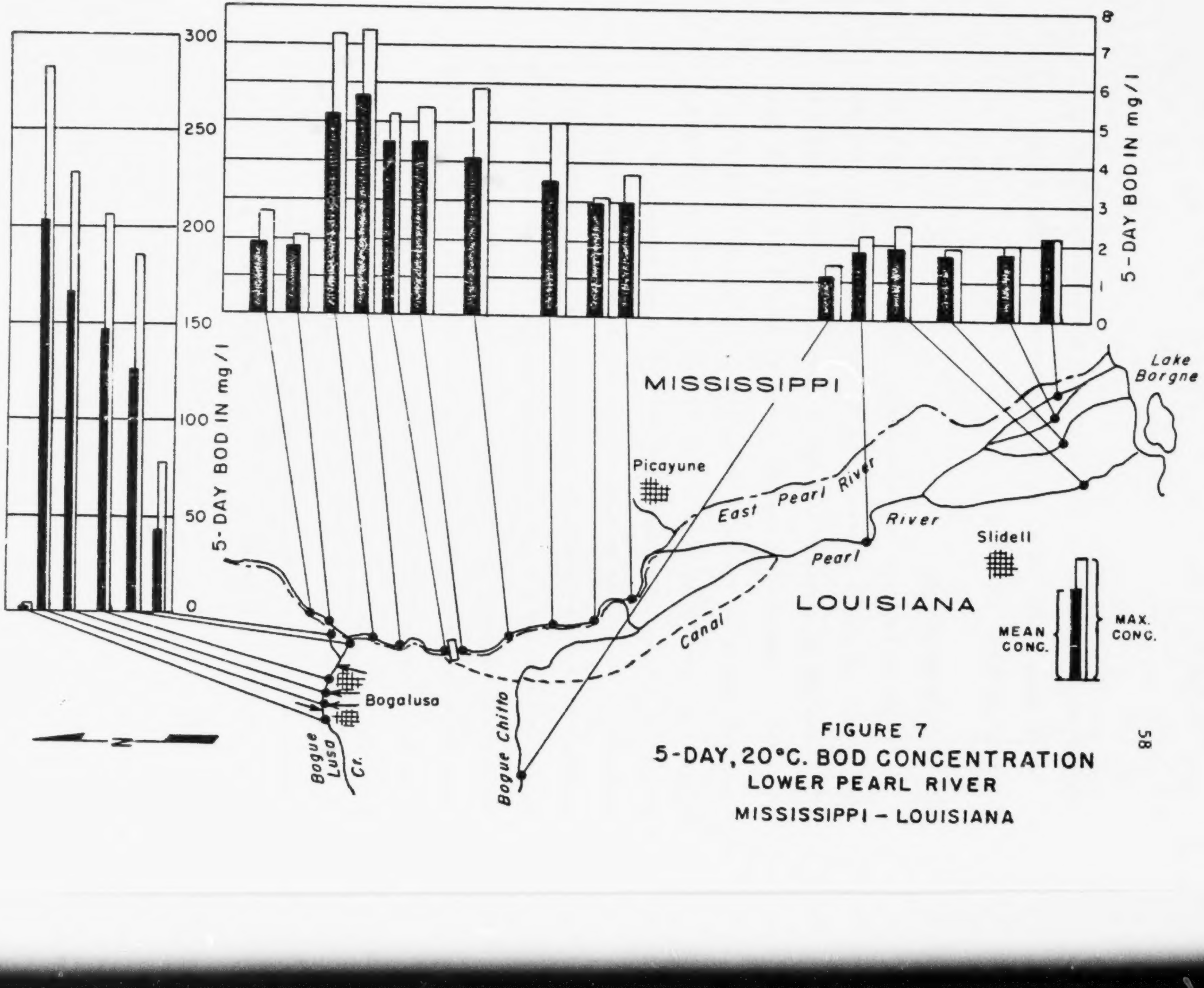
300
250
200
150
100
50
0
5-DAY BOD IN mg/l
8
7
6
5
4
3
2
1
0
5-DAY BOD IN mg/l
MISSISSIPPI
LOUISIANA
Lake Borgne
Picayune
East Pearl River
Pearl River
Slidell
Canal
Bogue Chitto
Bogalusa
Bogue Lusa Cr.
N
MEAN CONC.
MAX. CONC.

FIGURE 7
5-DAY, 20°C. BOD CONCENTRATION
LOWER PEARL RIVER
MISSISSIPPI – LOUISIANA

Dissolved Oxygen

The effect on the stream of oxygen consuming pollutional material that is expressed as B.O.D. may be measured as D.O. (dissolved oxygen) and is summarized in Figure 8. It is generally accepted to be desirable to maintain an average concentration of 5 mg/l of D.O. in a stream in order to provide a healthy biological environment. The average concentration of D.O. at the various stations during the period of the survey is shown as a shaded bar on the figure and the minimum values of single samples are shown as unshaded bars. On Bogue Lusa Creek above the points of discharge of municipal waste or pulp and paper mill waste the average D.O. value was 7.7 mg/l while at the mouth of Bogue Lusa Creek the average value was 0.1 and at the mouth of Coburn Creek the presence of dissolved oxygen was not observed. The lack of dissolved oxygen at the mouths of the creeks was evidence of excessive pollution in interstate waters; at the two control stations above the mouth of Bogue Lusa Creek on the Pearl River the average D.O. value was 7.6 mg/l which is quite well above the minimum desirable level of 5.0 mg/l; while on the Pearl River below Bogue Lusa Creek to Lower Walkiah Bluff the D.O. was above the desirable limit of 5 mg/l and ranged up to 6 with the exception of immediately above Pool's Bluff Sill where the average concentration of D.O. was 4.0 mg/l. The average concentration of dissolved oxygen in unpolluted Bogue Chitto Creek was 7.4 mg/l. At old U.S. 11 and U.S. 90 the average dissolved oxygen was 6.8 mg/l which is a satisfactory concentration. Concentration of dissolved oxygen in the Middle rivers at U.S. 90 was approximately 6 mg/l.

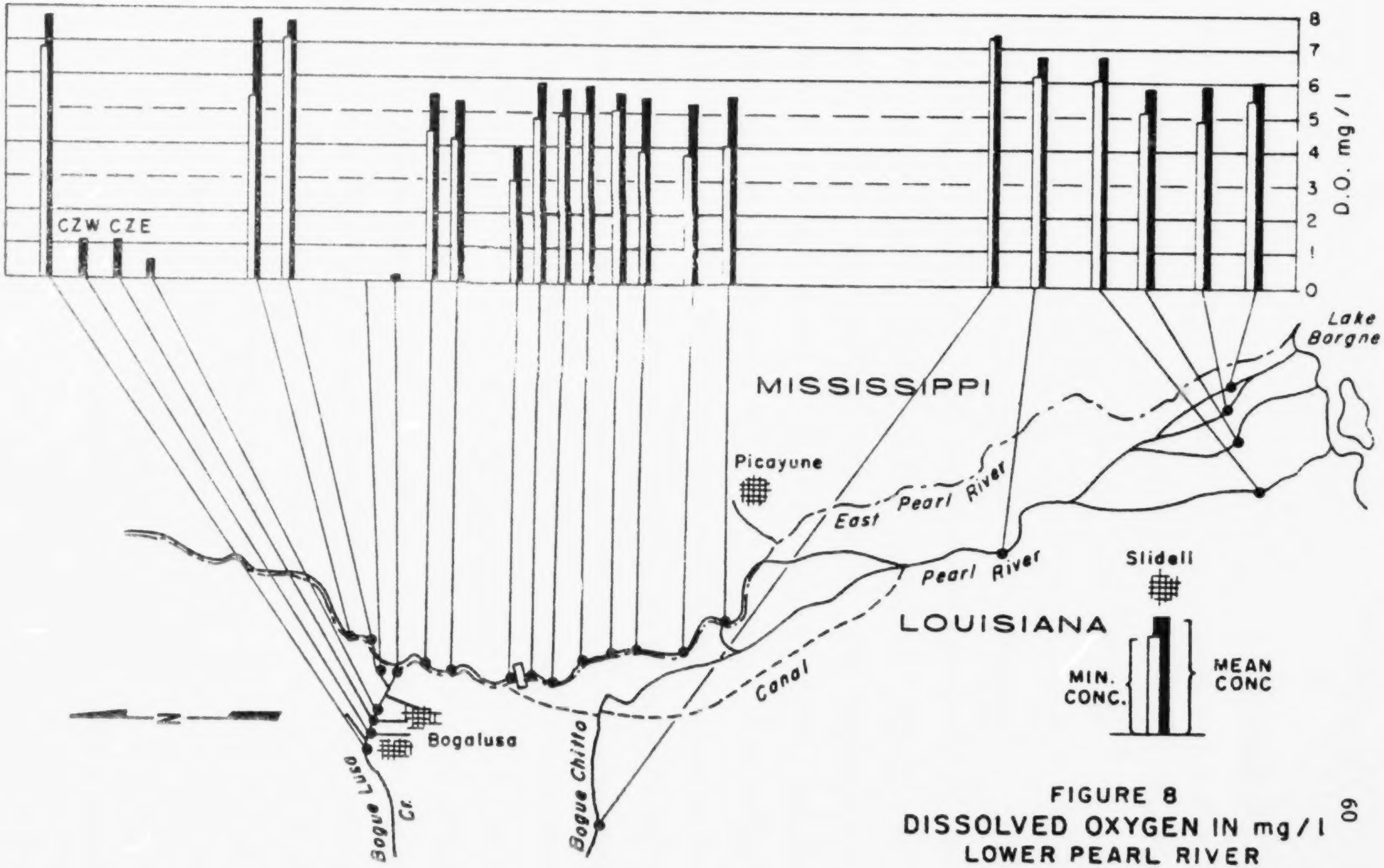

FIGURE 8
DISSOLVED OXYGEN IN mg/l
LOWER PEARL RIVER
MISSISSIPPI — LOUISIANA

Returning to above Pool's Bluff Sill it may be noted that the average D.O. was 4 mg/l with a minimum value of 3 mg/l during the period of the survey. Immediately below this sill the average value was 5.9 mg/l and the minimum value was 4.9 mg/l. This increase in dissolved oxygen is due to the reaeration of the stream caused by the water spilling over the low head dam that constitutes the Sill. As long as all of the flow of the stream goes over this sill, the Sill is of considerable benefit to the stream.

Oxygen Sag Curve

Figure 9 shows the probability of drought flows for the Pearl River at Bogalusa, Louisiana, gage. An annual low flow of 1500 cfs (cubic feet per second) for one day can be expected. During the survey the flows were on the order of 2,000 cfs. Once in 10 years an average discharge of 1,100 cfs for a period of 7 days can be expected. Oxygenation constants and stream reaeration constants for the oxygen sag curve observed during the period of this survey were calculated on an electronic analog computer, as detailed in Appendix C. Using these constants, dissolved oxygen concentrations for other stream conditions were calculated on the analog computer. The results of some of these computations are shown on Fig. 10.

The immediate oxygen demand on the Pearl River caused by the anaerobic conditions in Bogue Lusa Creek and the oxygen demand from the deposited fibers in the vicinity of Richardson's Landing exerted a heavy demand on the oxygen assets of the stream. For the B.O.D. load observed

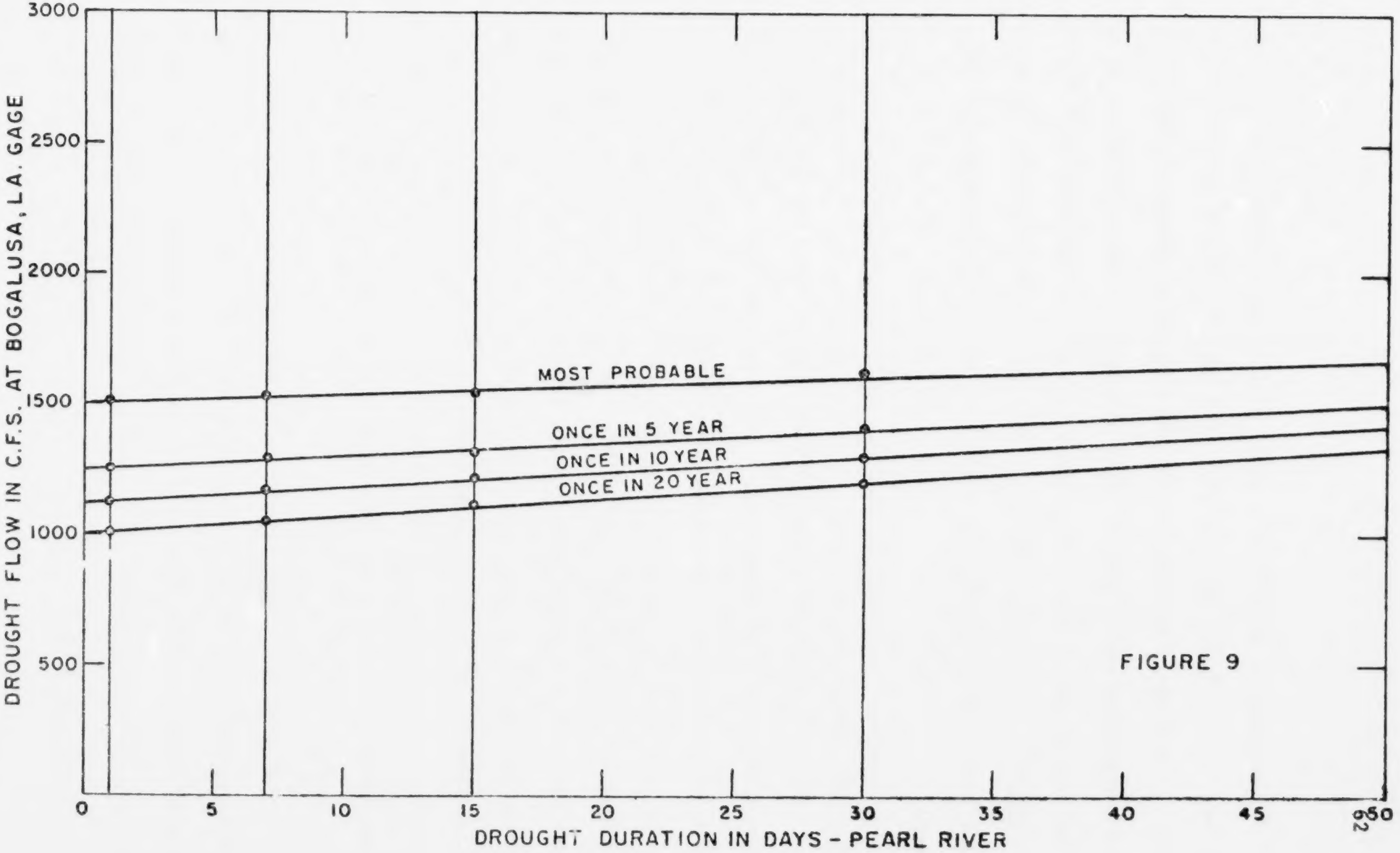
3000
2500
2000
1500
1000
500
DROUGHT FLOW IN C.F.S. AT BOGALUSA, LA. GAGE
MOST PROBABLE
ONCE IN 5 YEAR
ONCE IN 10 YEAR
ONCE IN 20 YEAR
0
5
10
15
20
25
30
35
40
45
50
DROUGHT DURATION IN DAYS - PEARL RIVER

FIGURE 9

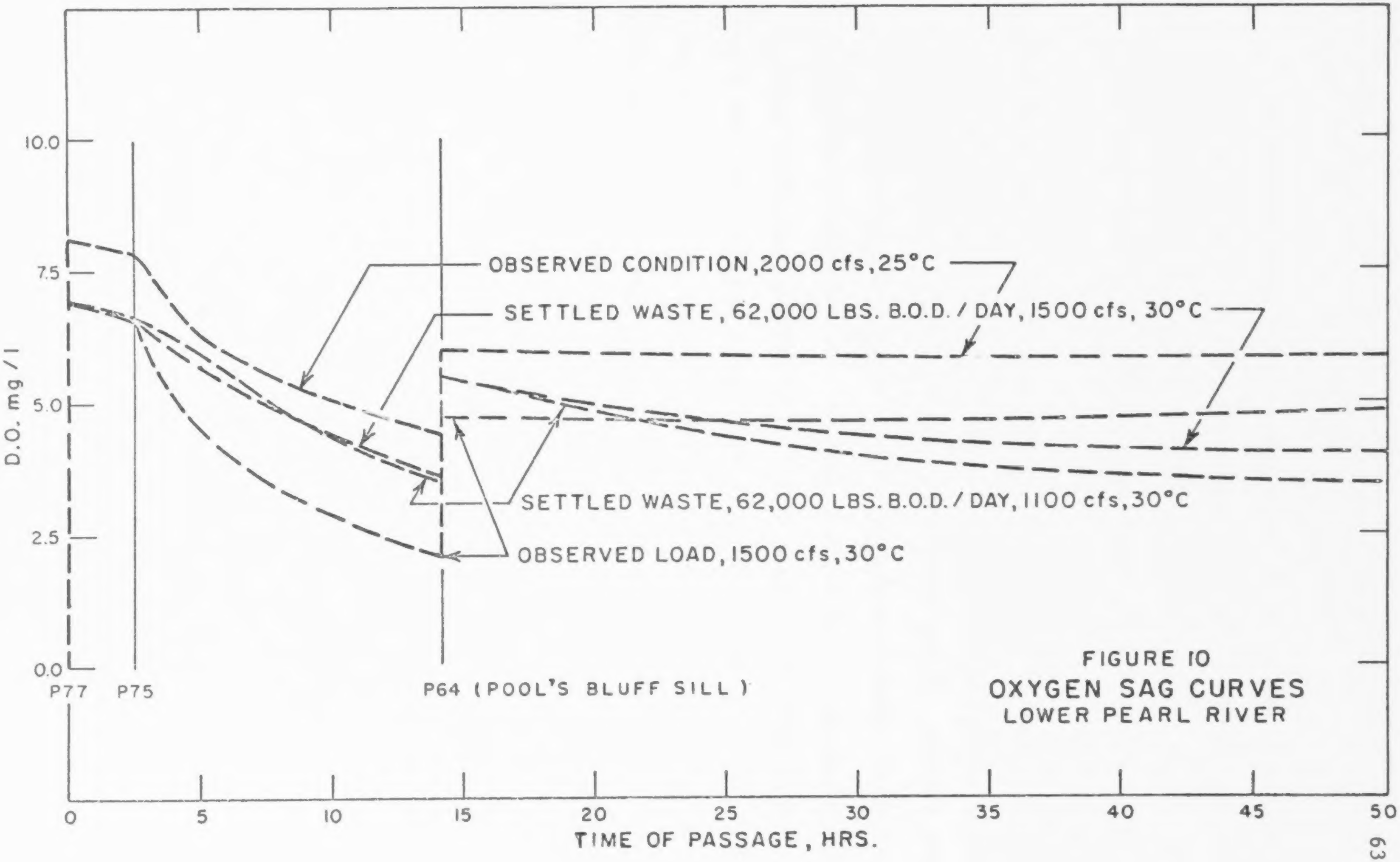

FIGURE 10
OXYGEN SAG CURVES
LOWER PEARL RIVER

during this survey but at flows of 1,500 cfs and water temperature conditions of 30°C (86°F) it is estimated that the oxygen concentration would be less than 3 mg/l above Pool's Bluff Sill. At flows of 1,100 cfs and temperatures of 25°C, about the same undesirable conditions are estimated.

The proposed treatment of the pulp and paper mill wastes by primary sedimentation should alleviate the conditions caused by the fibers settling in the streams. It was assumed that primary sedimentation would be accompanied by an increase in waste discharge from the pulp and paper mill to 62,000 pounds per day of B.O.D.[3] At 2,000 cfs, this would result in a D.O. of 5.6 mg/l above Pool's Bluff Sill, 5.5 at the sag point down stream, at 25°C; for 30°C the D.O. would be 4.2 and 4.7 respectively. For a stream flow of 1,500 cfs at 30°C the D.O. would be 3.6 mg/l above the Sill and 4.2 at the downstream sag point. For 25°C and 1,100 cfs the values would be 4.8 and 4.0. These are to be compared to an objective of 5.0 mg/l D.O.

1963 Data

Following unusually low winter runoff in the Pearl River valley, the Louisiana Stream Control Commission collected the following information on the Lower Pearl:

Date	Flow cfs	Temp. °C	Dissolved Oxygen, mg/l Pool's Bluff	Above Bogue Lusa
June 13	1035	31.5	1.0	
14	1025	31	1.6	
15	1020	31	1.8	
16	1000	30.5	2.0	
17	990	30.5	1.8	6.2
18	985	29	1.6	6.0
19	980	28.5	1.8	6.9
20	980	27.5	3.2	7.2
23	1060	27	1.2	
24	1066	28	0.8	
25	1145	28	1.0	
26	1196	28.5	1.6	
27	1495	29	4.8	
28	1877	27.5	4.0	6.6
29	1532	29.5	4.6	8.4
30	1125	29	5.2	8.6

Computations made on the analog computer had indicated that for waste loads observed during the survey but for stream flows of 1,100 cfs and 30°C the D.O. above Pool's Bluff Sill would be 1.1 mg/l if the D.O. at P-77 was 7.0 mg/l. The 1963 data are a very satisfactory confirmation of the computations.

These 1963 data are noteworthy because of the simultaneous occurrence of low stream flows on the order of 1,000 cfs and temperatures of 30°C. This event is quite unexpected.

EAST PEARL RIVER

The general location of sampling stations established on the East Pearl River and its tributaries during this survey are indicated on Figure 3.

Biological Investigations

Biological samples were collected on the East Pearl in a manner similar to that on the Lower Pearl. A summary of the biological data is presented in Figures 11 and 12.

A collection 6 miles above the mouth of West Hobolochitto Creek produced a clean water group of organisms.

Biological samples collected from the upstream control station on East Hobolochitto Creek (H16) about 8 miles above Picayune, Mississippi, possessed a diverse population of bottom organisms indicative of good water quality. Above U.S.Highway 11 bridge samples revealed a degraded population of bottom organisms compared to the upstream station. A quantitative reduction in total population was noted and some bottom organisms such as immature stoneflies, hellgrammites, clams, and one species of immature caddisfly were not found at this station. A small number of intolerant organisms (immature caddisflies and mayflies) observed in the qualitative sampling may have been caused by bottom organism repopulation, or drifting organisms that had not yet succumbed to existing conditions. The cause of this reduction in bottom animal population may have been an accidental or periodic discharge of a pollutant from an unknown upstream source. At Burnt Bridge (H4), below the discharge from Crosby Chemicals, Inc.,

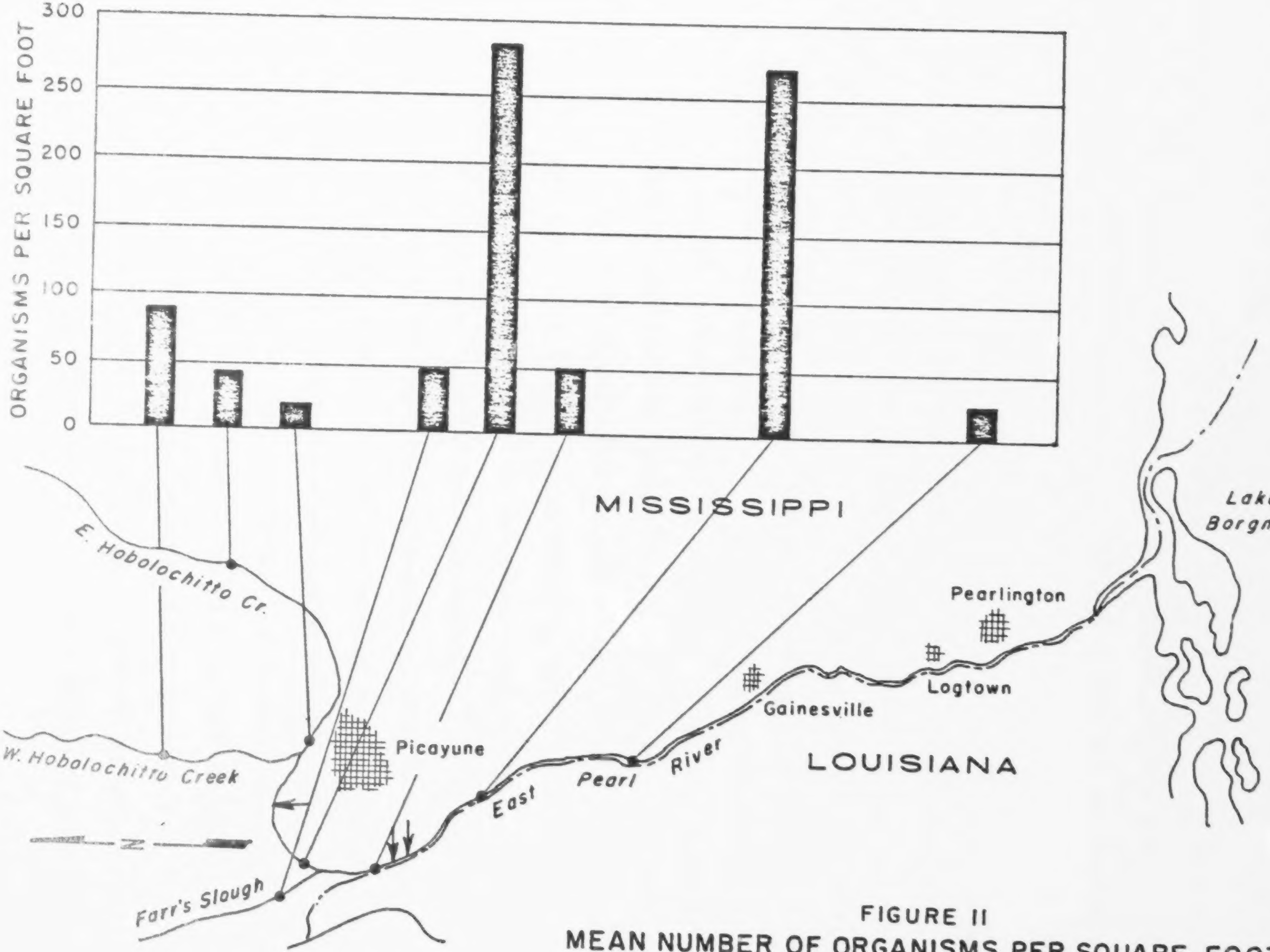

FIGURE II
MEAN NUMBER OF ORGANISMS PER SQUARE FOOT
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

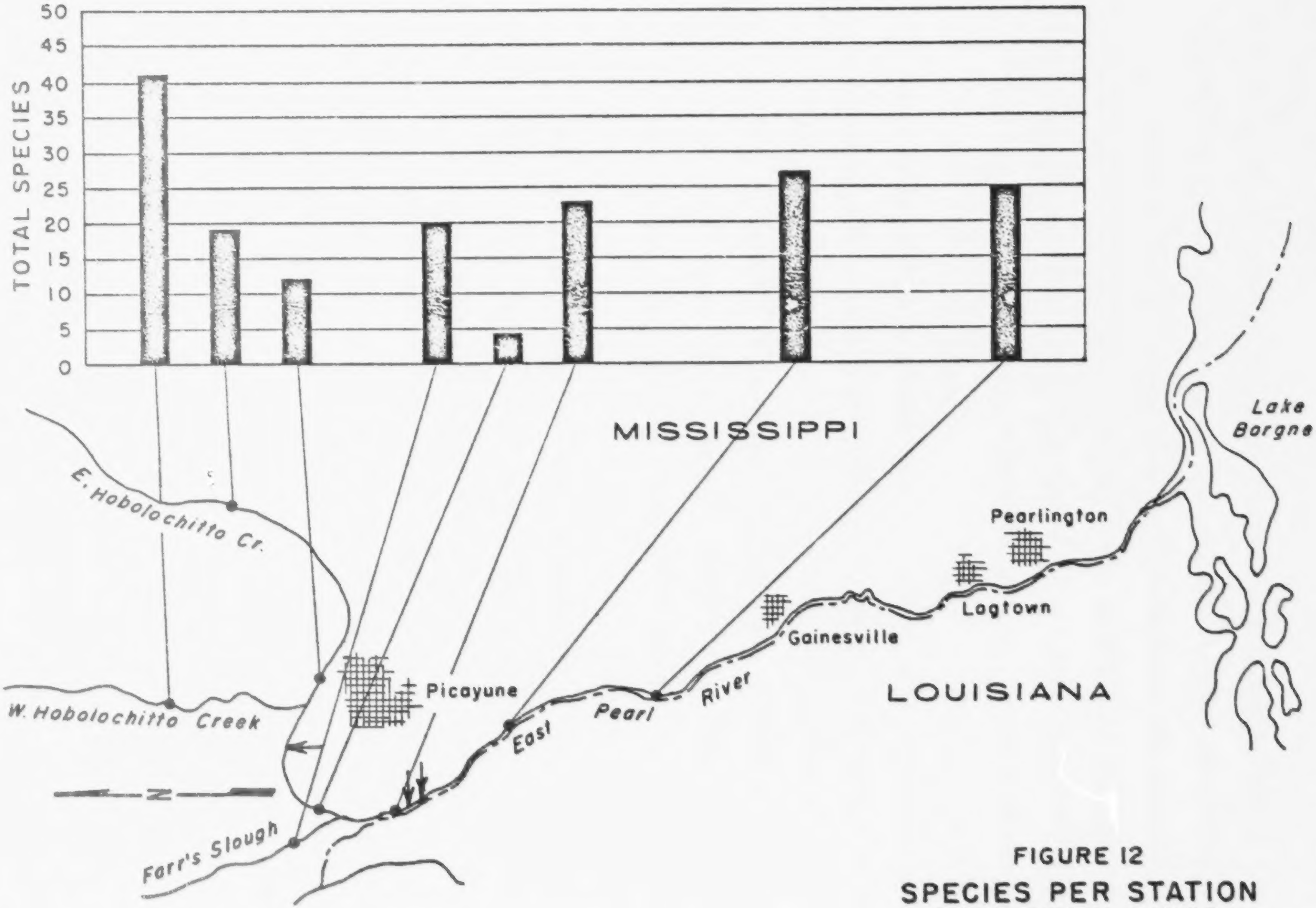

FIGURE 12
SPECIES PER STATION
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

biological samples showed distinct effects from pollution on the stream bottom. The reduction in the variety of organisms, the increase in numbers of tolerant forms (sludgeworms and bloodworms), and the absence of sensitive forms (immature mayflies, caddisflies, etc.) indicated a degradation of this area. In addition, bacterial slimes were obvious on higher aquatic plants and other supporting objects. Heavy algal blankets covered sand bars and the bottom of pools.

Qualitative sampling in Farr's Slough demonstrated the presence of clean water associated organisms. The supporting objects on the bottom of the stream in Hobolochitto Creek were covered with an algal blanket that supported many bloodworms, while this blue-green algal blanket was lacking in Farr's Slough (confluence stream). The addition of water from Farr's Slough had much to do with the recovery of downstream stretches of Hobolochitto Creek.

Biological samples collected at the first station in interstate waters at Jackson's Landing (EP-32) showed partial stream recovery. Bottom dwelling organisms were more diverse (Figure 12) than at the upstream station (H-4). The quantity of bloodworms and sludgeworms was also reduced at Jackson's Landing. Biological samples collected in the reach from Jackson's Landing to Pearlington, Mississippi, indicated that stream bottom organisms were not affected by pollution.

Coliform Bacteria

The summary data of mean coliform concentration of the East Pearl River during the survey is presented in Figure 13. At the clean water control station (H16) on East Hobolochitto Creek the density of coliform bacteria was in excess of 5,000 MPN/100 ml with an average value of 8,740, the density of fecal coliform however was 306 MPN/100 ml. This was the only sign of pollution at this control station. Bacteriological samples were collected from the water intake impoundment for Crosby Chemicals, Inc., just below the Beech Street bridge (H7). The average coliform concentration was 5,938 MPN/100 ml with a single extreme value of 54,200, while the average fecal coliform density was 3,363 MPN/100 ml. Other than this coliform pollution the station appeared to be a clean stream station and suitable control for Hobolochitto Creek, which was receiving discharges from Crosby Chemicals, Inc., just downstream. At Burnt Bridge, (H4), below the discharge from Crosby Chemicals, Inc., the coliform density was 8,705 MPN/100 ml on the average. In interstate water at new U.S. 11 bridge (EP-28) below the sewage discharge from the city of Picayune the density of coliform organisms increased to 120,750 and the density of fecal organisms was 25,175 MPN/100 ml. At old U.S. 11 bridge (EP-22) the average density of coliform organisms had been sharply reduced to 18,229 MPN/100 ml with average density of fecal organisms of 2,319. At Gainesville, Miss. (EP-16) the coliform density was reduced to below 5,000 having a value of 4,495. The coliform density increased slightly to an average of 7,550 at Logtown and then dropped back to an average value of 4,050 at U.S. 90 bridge (EP-5).

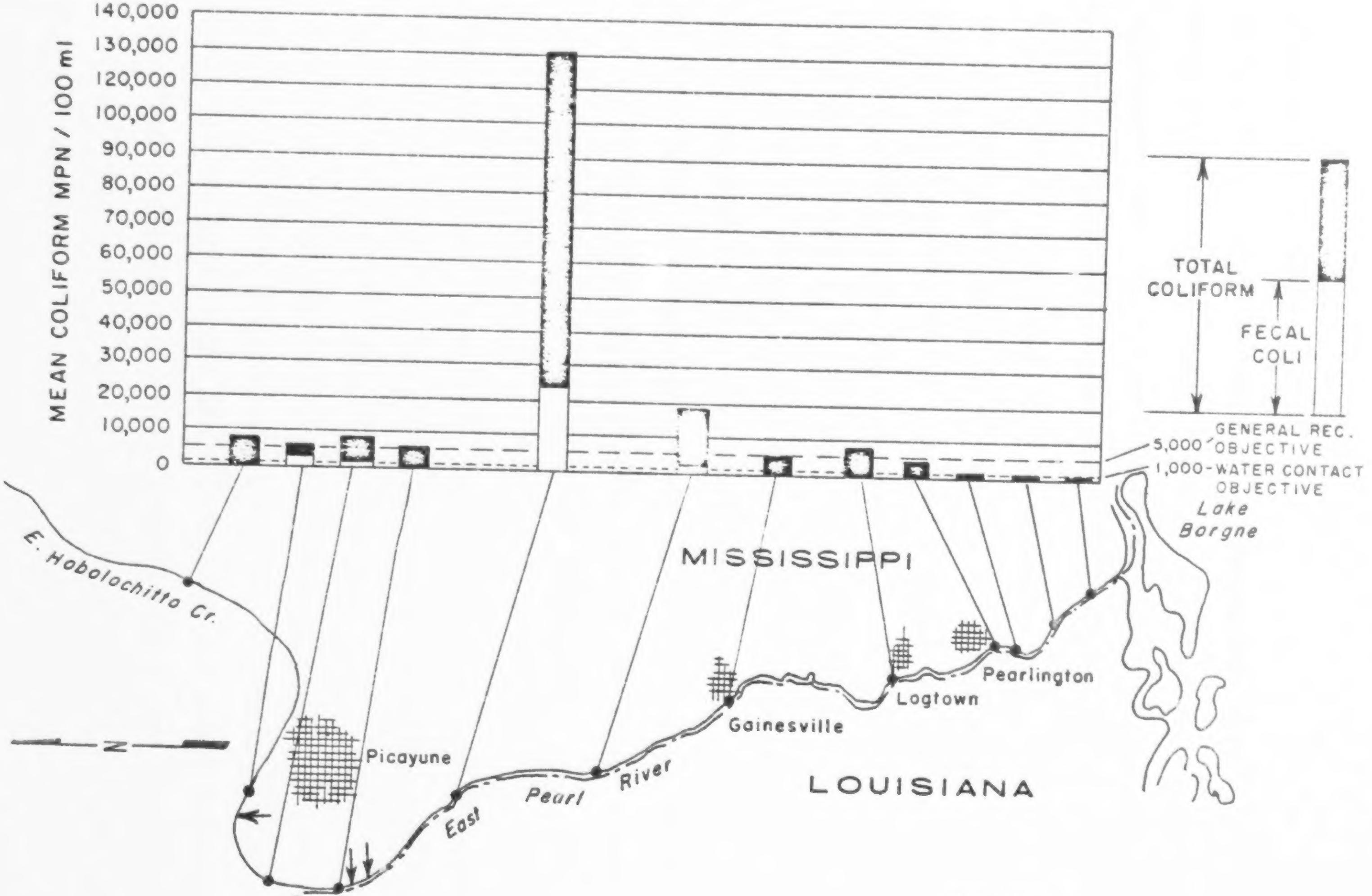

FIGURE 13
MEAN COLIFORM DENSITY (MPN PER 100ml)
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

Samples were collected and analyzed by the Mississippi State Board of Health from Pearlington (EP-4) on the East Pearl River downstream and out into the Mississippi Sound. These data are summarized in Figure 14. From Pearlington to the confluence of the East Pearl River and Lake Borgne (LB-5) the coliform index showed a continuing reduction in such bacteria. For five stations in the Sound, during the period of this survey, the MPN/100 ml was less than the maximum concentration recommended for areas approved by U. S. Public Health Service for direct harvesting of shellfish. These data compare well with those reported by Louisiana State Board of Health[4] for August and September, 1962.

Biochemical Oxygen Demand

The concentration of B.O.D. data for the East Pearl River are summarized in Figure 15. The clean water control station (H-16) on East Hobolochitto Creek had an average of B.O.D. concentration of 1.0 mg/l which is the normal background for an unpolluted stream. The sample collected at Beech Rd. bridge (H-7) also showed a clean stream condition as far as B.O.D. was concerned. At Burnt Bridge (H-4), below the discharge from Crosby Chemicals, Inc., the organic pollution expressed as B.O.D. had increased four fold from that at Beech Rd. indicating a source of pollution which was confirmed by the biological samples. Chemical samples collected at Jackson's Landing (EP-32) showed a reduction in B.O.D. and some stream recovery. The chemical sample collected at new U.S. 11 bridge (EP-28) below the discharge from Picayune, Mississippi, showed a slight increase of B.O.D. to an average value of 4.1 mg/l. From here on down stream

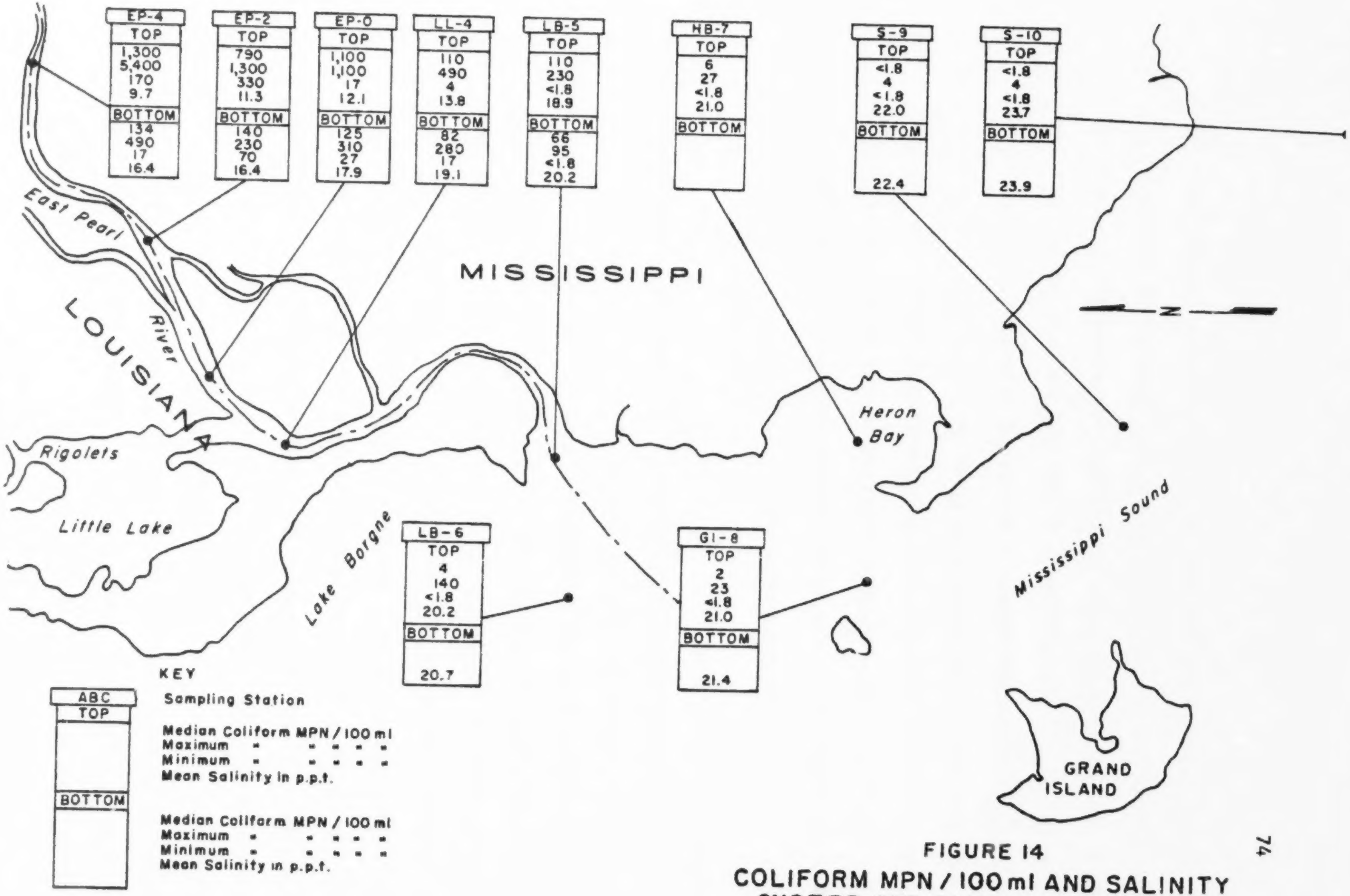
EP-4
TOP
1,300
5,400
170
9.7
BOTTOM
134
490
17
16.4
EP-2
TOP
790
1,300
330
11.3
BOTTOM
140
230
70
16.4
EP-0
TOP
1,100
1,100
17
12.1
BOTTOM
125
310
27
17.9
LL-4
TOP
110
490
4
13.8
BOTTOM
82
280
17
19.1
LB-5
TOP
110
230
<1.8
18.9
BOTTOM
66
95
<1.8
20.2
HB-7
TOP
6
27
<1.8
21.0
BOTTOM
S-9
TOP
<1.8
4
<1.8
22.0
BOTTOM
22.4
S-10
TOP
<1.8
4
<1.8
23.7
BOTTOM
23.9
MISSISSIPPI
N
East Pearl
River
LOUISIANA
Rigolets
Little Lake
Lake Borgne
Heron Bay
Mississippi Sound
LB-6
TOP
4
140
<1.8
20.2
BOTTOM
20.7
GI-8
TOP
2
23
<1.8
21.0
BOTTOM
21.4
GRAND ISLAND
KEY
ABC
TOP
BOTTOM
Sampling Station
Median Coliform MPN / 100 ml
Maximum " " " "
Minimum " " " "
Mean Salinity in p.p.t.
Median Coliform MPN / 100 ml
Maximum " " " "
Minimum " " " "
Mean Salinity in p.p.t.

FIGURE 14
COLIFORM MPN / 100 ml AND SALINITY
OYSTER BED SAMPLING STATIONS
MISSISSIPPI – LOUISIANA

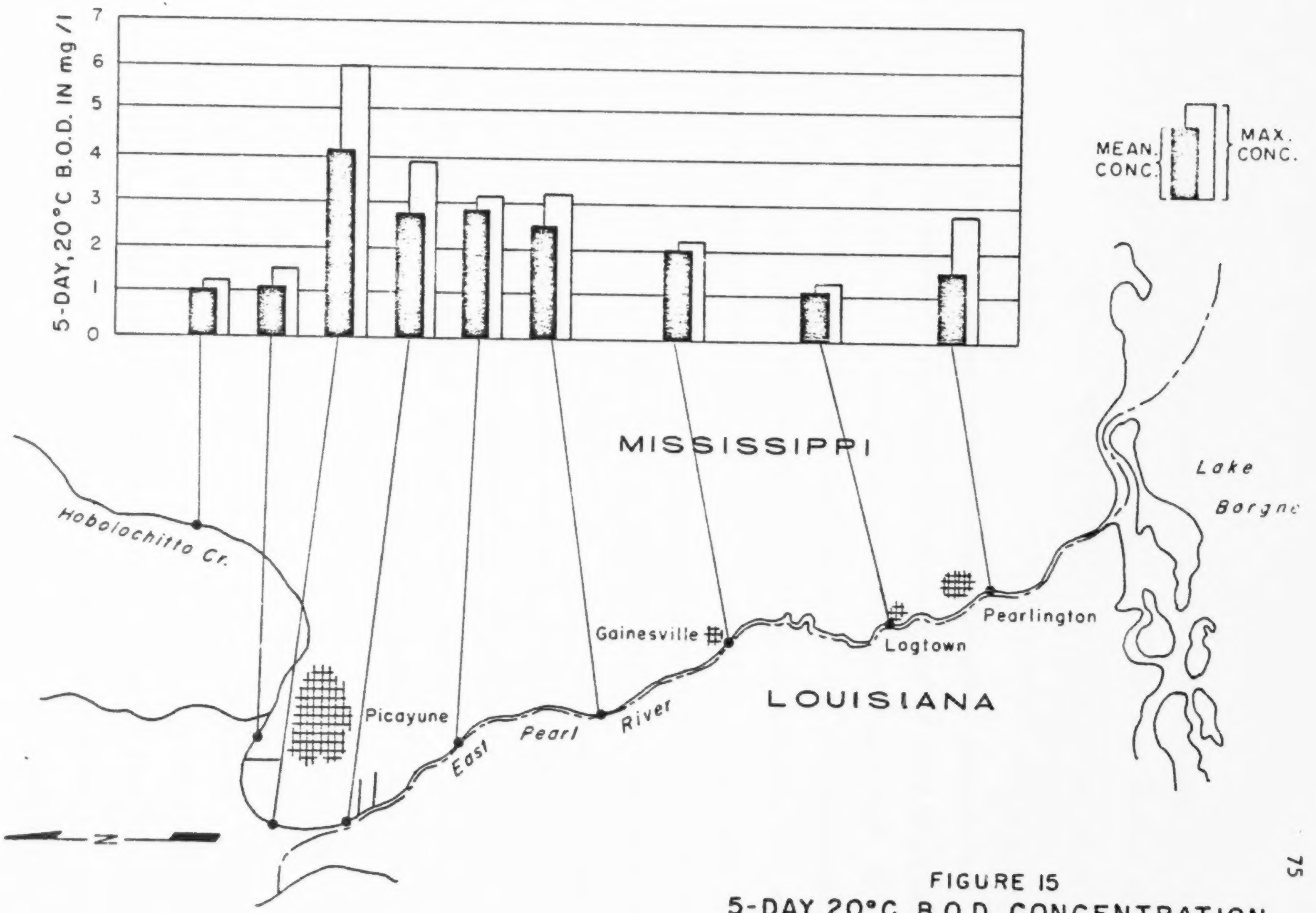

FIGURE 15
5-DAY, 20°C. B.O.D. CONCENTRATION
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

the B.O.D. showed consistent reduction through Logtown, but then showed a slight increase to a value of 1.6 mg/l at U.S. 90 bridge (EP-5) which is not inconsistent with a clean stream condition.

Dissolved Oxygen

The dissolved oxygen data expressed in milligrams per liter for the East Pearl River during the period of the survey are presented in Figure 16. The clean stream control station (H-16) on East Hobolochitto Creek approximately 8 miles above Picayune, Mississippi, showed an average D.O. concentration of 7.1 mg/l. At Beech Rd. bridge (H-7) the average value was 6.4. At Burnt Bridge (H-4) below the discharge from Crosby Chemicals, Inc., the average D.O. concentration was 2.5 with a maximum of 3.7 and a minimum of 1.6 mg/l, all of which were substantially below the desirable lower limit of 5.0 mg/l. In interstate water, at Jackson's Landing (EP-32) the average value of D.O. increased to 3.9; and to a value of 4.1 at U.S.11 bridge (EP-28). The concentration of dissolved oxygen at the remaining stations on East Pearl River were in excess of 5.0 for average conditions during the period of the survey.

Crosby Chemicals, Inc.

On September 26, 1962, waste discharged by Crosby Chemicals, Inc. drastically altered the stream biology. The most obvious effect was the severe destruction of fish life. The fish kill was observed downstream from Burnt Bridge (H-4) to two miles below old U.S. 11 Bridge (EP-22) a distance of 17 miles. The precise downstream limit is not known, but dead fish were reported at Gainesville, Mississippi (EP-16). This is a total reach of

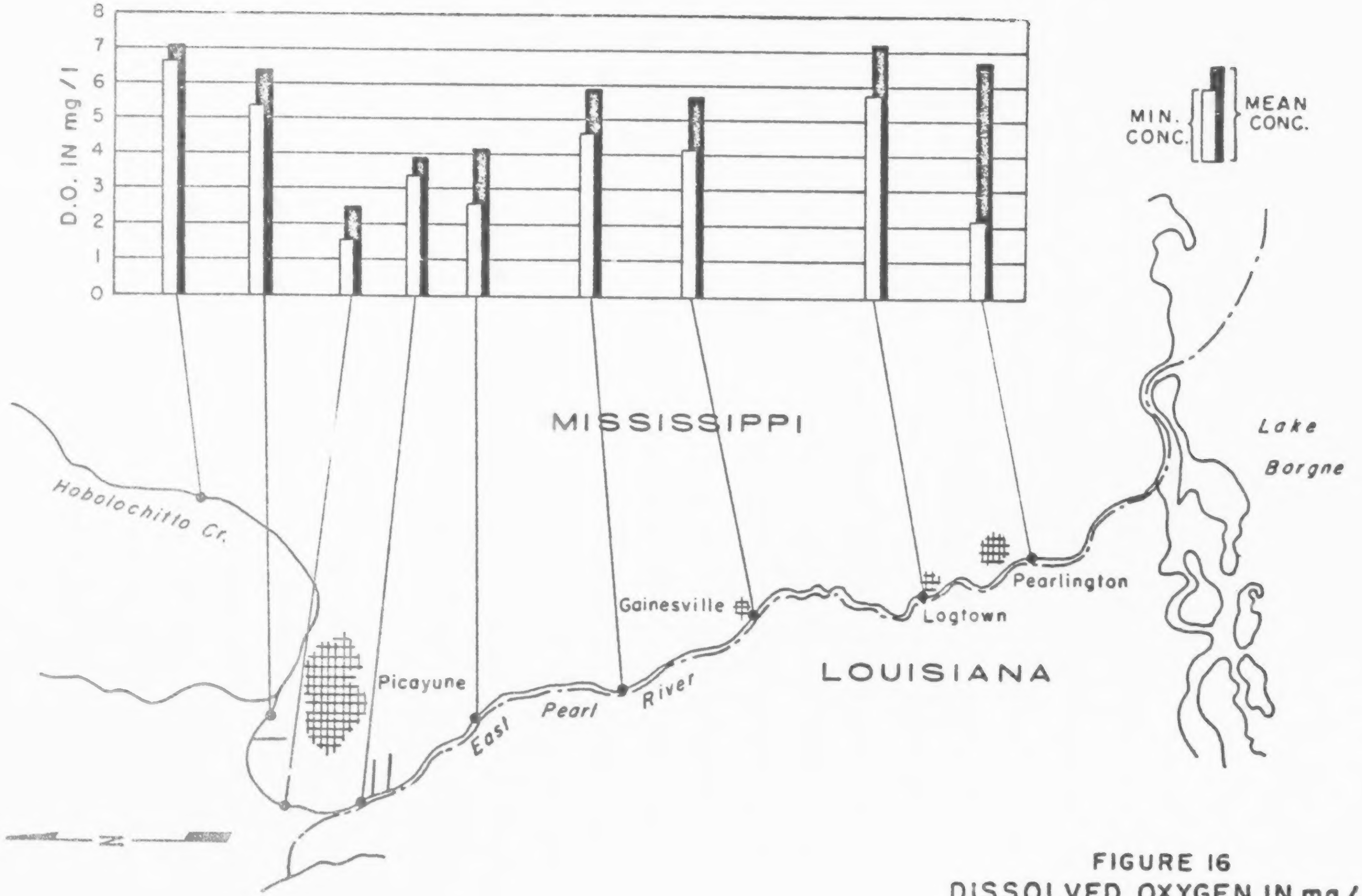

FIGURE 16
DISSOLVED OXYGEN IN mg / l
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

17 miles of interstate water.

In the upstream areas (H-4 and EP-32), the conditions were sufficiently severe to kill gar. Gar are believed to have survived downstream at EP-22, but game fish (bass, bluegills and crappies) were killed to below Station EP-22. Rough fish and forage fish (minnows, eels, flounders, mullets, catfish and suckers) suffered a similar fate. Of particular interest was the destruction of several (8 observed) large sturgeon (3 to 4 feet in length).

Most of the bottom dwelling animals were also killed in the affected area; the number of kinds found at the survey stations was much reduced (Figure 17), the 3 lower stations being in interstate water. Those organisms that survived are capable of withstanding extended periods of zero D.O. or are capable of obtaining oxygen at the air-water interface. The destruction of bloodworms and sludgeworms at Burnt Bridge (H-4) suggests the presence of an unknown toxic substance since these worms can survive extended periods (several weeks) of zero D.O.[6]

Following the observation of the effects of the unusual discharge to the East Pearl on September 26, the frequency of chemical sampling was increased. In the tabulation of the data, the two series of data are separated and considered separately. The D.O. and the C.O.D. (chemical oxygen demand) data are presented in Figures 18 and 19. These figures are isometric presentations. Concentrations are plotted vertically, time is plotted across the figure, and the river miles are plotted up the figure.

In Figure 18 the period of zero D.O. at the various stations is shown as a path increasing in width from Station H-4, below Crosby Chemicals'

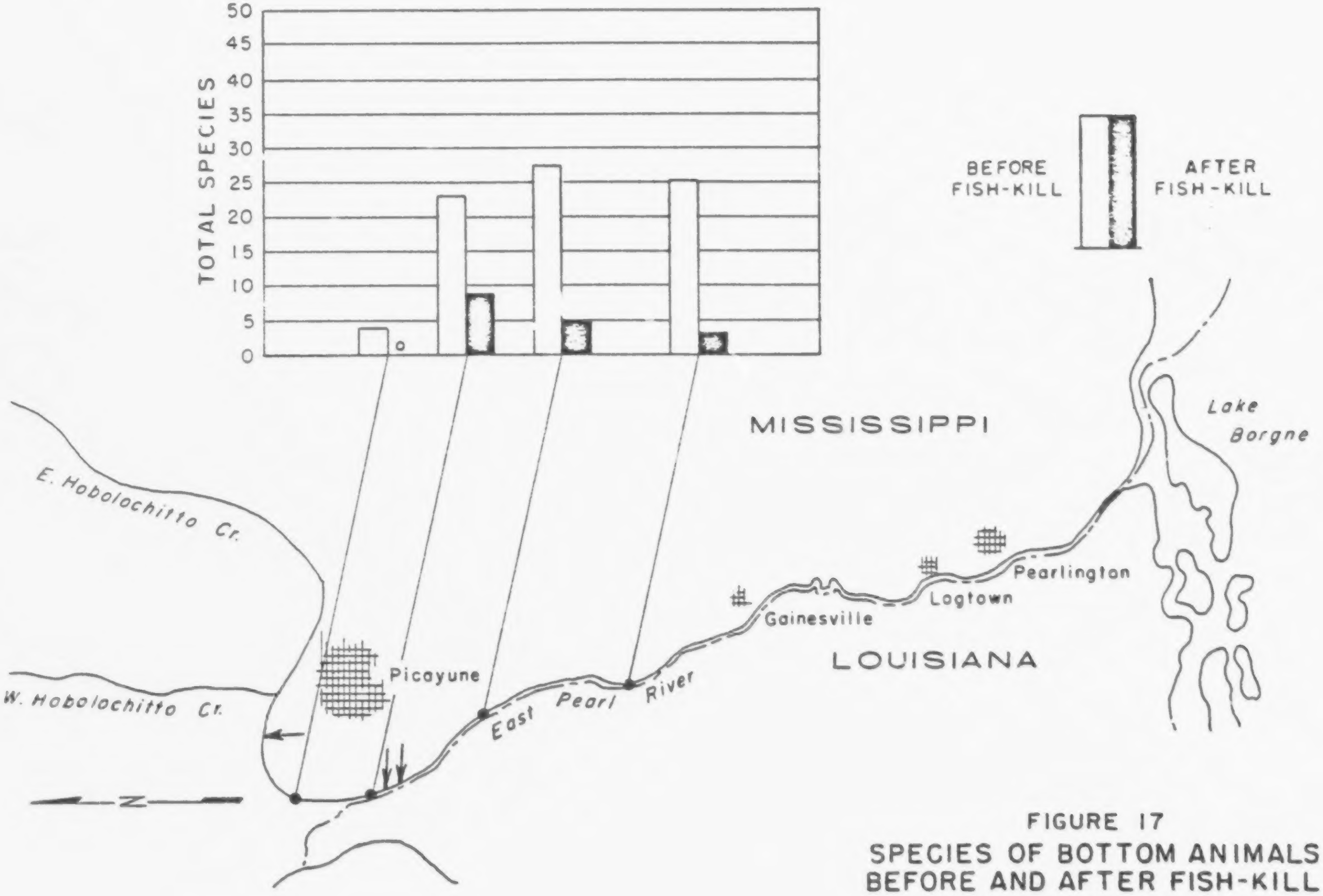
TOTAL SPECIES
50
45
40
35
30
25
20
15
10
5
0
o
BEFORE FISH-KILL
AFTER FISH-KILL
MISSISSIPPI
LOUISIANA
Lake Borgne
E. Hobolochitto Cr.
W. Hobolochitto Cr.
Picayune
East Pearl River
Gainesville
Logtown
Pearlington
N

FIGURE 17
SPECIES OF BOTTOM ANIMALS
BEFORE AND AFTER FISH-KILL
EAST PEARL RIVER
MISSISSIPPI – LOUISIANA

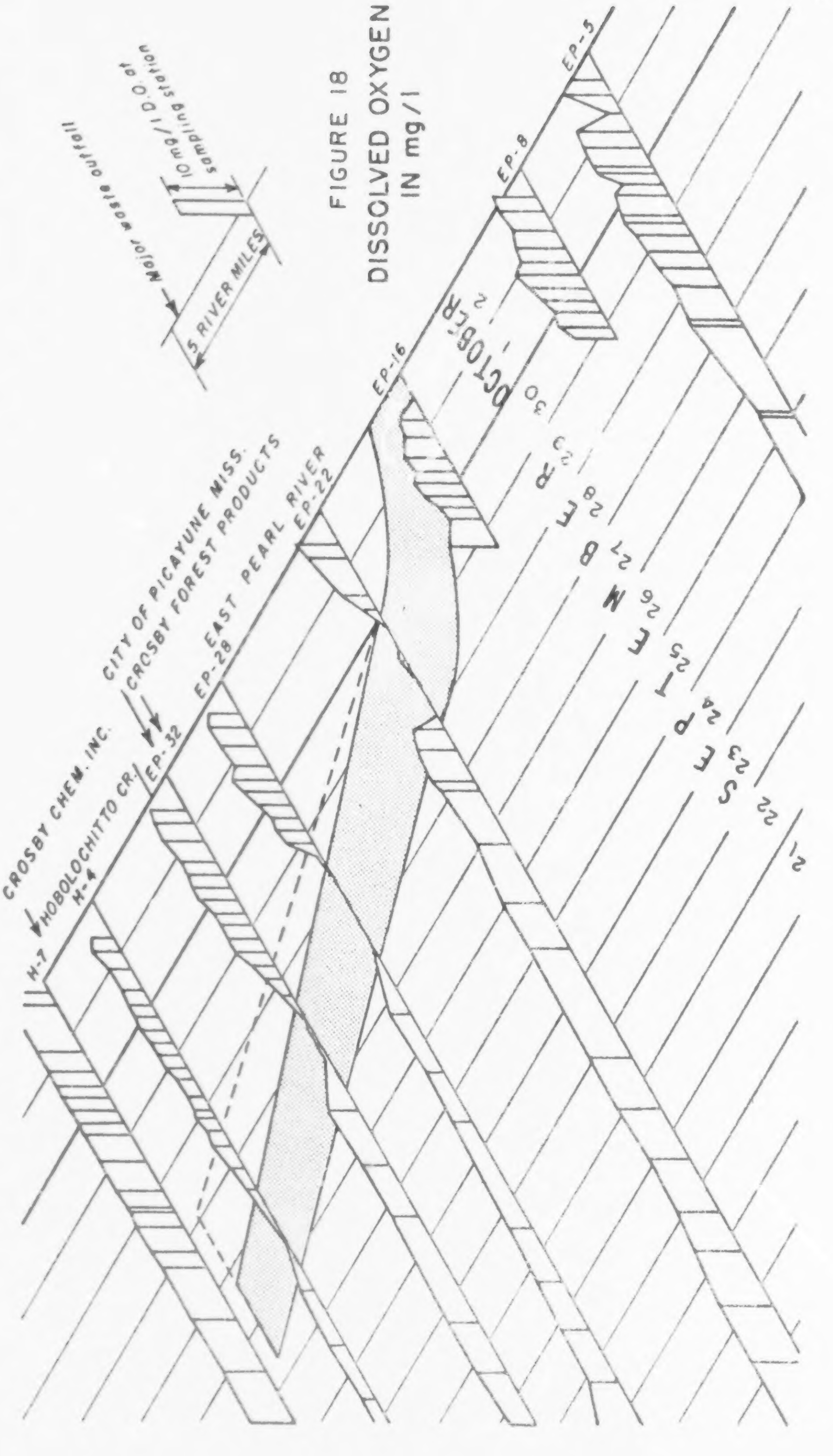

FIGURE 18
DISSOLVED OXYGEN
IN mg/l

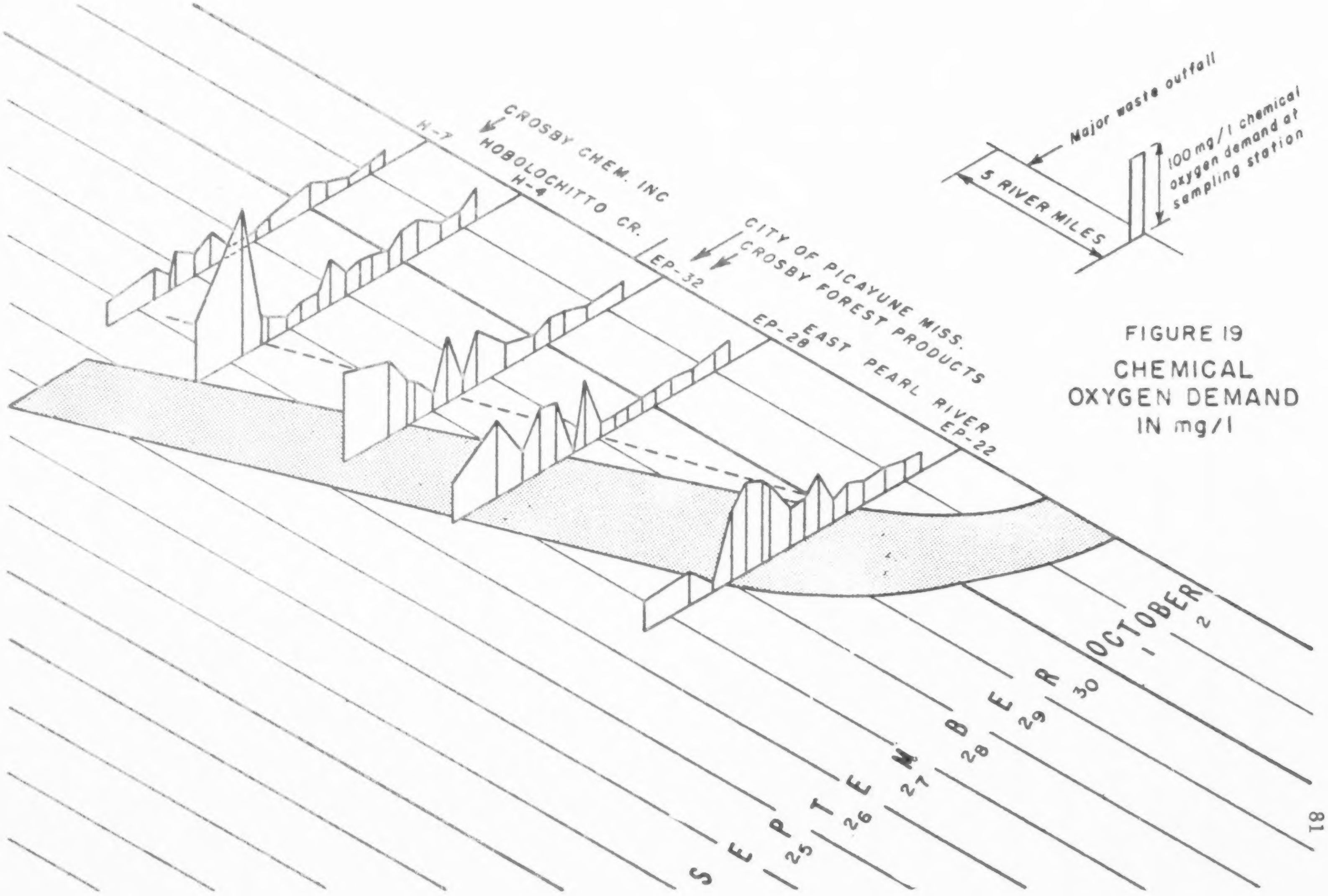

FIGURE 19
CHEMICAL
OXYGEN DEMAND
IN mg/l

outfall, down to EP-16 at Gainesville, where the tide slows the river velocity and dilution and mixing causes the path to curve away. The persistence of zero oxygen conditions varied from several hours to two days or more, and low D.O. periods prevailed for longer periods of time in the 17 mile reach of interstate water shown in Figure 18.

In Figure 19 the zero D.O. path from Figure 18 is shown again. There are no C.O.D. data available previous to about noon on the 27th so that values cannot be shown for an earlier time. At the Beech Road bridge control station (H-7) the average C.O.D. was 25.9 mg/l with a range from 12.7 to 47.0. Maximum observed values of C.O.D. at the various stations were as follows:

171 at H-4
105 at EP-32
77 at EP-28
107 at EP-22

The higher values of C.O.D. correspond with the zero D.O. path, and also suggest a later discharge of organic material without so much immediate oxygen demand as the initial discharge. Values of C.O.D. at Station EP-16 are not shown because the concentration of chlorides from the salt water interfered with the determination at that station and below.

In Figures 18 and 19, all of the East Pearl River is interstate water.

The chemical sample collected at EP-28 (in interstate water) on September 27, 1962 at 5:20 P.M. was subjected to additional analysis. A petroleum ether extract to determine the amount of oil showed a negligible amount of ether extractible material. A second aliquot was extracted with chloroform and prepared for infra-red study. An interpretation of the infrared spectrum indicated that the most probable organic contaminants in the sample were fatty acids with and without attached benzene rings. Resin acids possess similar structures. It may be assumed, then, that the pollutants in this case were derived from the tall oil processing operations. The infrared spectra suggested considerable oxidation indicating that the original waste material had been partially oxidized in the holding pond or in the stream. Additional analyses were made for phenol and zinc with negative results.

It is reported[7] that the minimum lethal concentration of the sodium salt of the resin acid fraction of tall oil soap to minnows is 1 ppm.

EFFECTS OF WASTES ON WATER QUALITY

LOWER PEARL

Bottom dwelling organisms indicate that a minimum 11 miles of the Pearl River were highly degraded (from Bogue Lusa Creek to Pool's Bluff Sill), and an additional 2 miles (Coburn Creek to Bogue Lusa Creek) was degraded on the Louisiana side. The recovery stretch downstream from Pool's Bluff Sill to P-50 provides a minimum additional 13 miles of stream that was partially degraded. The total of these segments show pollutional effects on the bottom dwelling organisms for a minimum of 26 miles, in interstate water.

A 1950 study on the "Lower" Pearl River[1] indicated that a minimum of 43 miles of stream exhibited pollutional effects on the biota. A major factor in the reduction of the length of the polluted reaches of the stream may be the installation of the navigation sill at Pool's Bluff (P-63.5) since the 1950 study. The impoundment caused by the construction of Pool's Bluff Sill provides for sedimentation of the fibers within the pool so that they are not distributed down a greater reach of the stream. The water spilling over the dam is effectively reaerated.

Discussions with fishermen along the river indicated that fishing was not as good in the Bogue Lusa Creek to Pool's Bluff reach of the river as in the reaches above or below this degraded area. This consensus of the fishing refers both to the quality of the fish and to the total fish caught. Another estimate by the U. S. Public Health Service stated that fish were adversely affected for a distance of 18 miles.[8] Utilization of nets for fish sampling operations during low flow periods in the Bogue Lusa Creek-Pool's Bluff reach of the stream was impractical because of fouling of the nets by paper fines.[3]

An extensive fish kill (Bogue Lusa Creek to Walkiah Bluff) occurred during the period July 15-16, 1960.[12] This fish kill was attributed to the discharge of a tank of soap and black liquor into the Pearl River by the Bogalusa Division of the Crown Zellerbach Corporation.

The utilization of the degraded stretch of the stream for recreational purposes is limited by the extensive amount of pollution. The presence of floating and suspended solids in the vicinity of Richardson's Landing (P-73) reduces utilization of this access area. The observed density of coliform bacteria throughout the entire reach of the interstate stream surveyed from Louisiana State Highway 10 to U.S. Highway 90 was in excess of 1,000 MPN/100 ml indicating that it would be hazardous to use the river for water contact sports. With the exception of the two end stations, at Louisiana State Highway 11 and U.S. 90, all stations showed an average total coliform density in excess of 5,000 MPN/100 ml which is considered to be the upper limit for general recreational use of the stream.

EAST PEARL

On Hobolochitto Creek at and above Beech Road the concentration of coliform organisms was of a magnitude to make the stream unsafe for water contact sports.

Prior to the unusual waste discharges on September 26, 1962, data obtained from sampling bottom dwelling organisms indicate that in the intrastate reaches of the stream, 4.8 miles (Crosby Chemical to Farr's Slough below Burnt Bridge) were degraded and 2.3 miles (on down to the state line) were in the process of recovery. An additional one mile of interstate water may be added to the recovery zone. A total of 8.1 miles of stream were thus affected by pollution, other than that measured by density of total coliform organisms.

Under stream conditions prevailing before September 26, 1962, the interstate waters of the East Pearl River were degraded for legitimate recreational uses by relatively high coliform densities. Water contact sports would be unsafe.

As a result of the unusual discharges from Crosby Chemicals, Inc., the recovery of the fish population will undoubtedly take a few years. Some fish survived by ascending tributaries, and would re-enter the stream forming a nucleus for repopulation. Within a year or two reproduction and immigration could re-establish a number of fish; however, many of these would be small and it would take time to grow catchable fish. Some examples of growth rates are as follows:[9]

	Length, Inches	Age, Years
Channel Catfish	8-16	3
Channel Catfish	15-28	6
Flathead Catfish	8-16	3
Flathead Catfish	15-29	6
Largemouth Bass	8-18	3
Bluegills	3-8	1
Bluegills	3-9	3

Removal of bottom organisms would reduce the rate of recovery of the fish population since these animals are an important food supply for fishes. Many forms of bottom animals should be re-established within a year, but a longer period of time may be necessary for the development of a normal population.

SALT WATER

The sanitary survey made by the Louisiana State Board of Health[4] indicates that there are potential sources of pollution to the oyster-growing areas. Their survey and the survey reported here did not show any unacceptable concentrations of coliform at the beds during the surveys.

SUMMARY AND CONCLUSION

During the period September 11 to October 2, 1962, the interstate reaches of the Pearl River, downstream from the northeast corner of Louisiana, the East Pearl River, and the oyster beds of Mississippi Sound were surveyed to determine the extent of the pollution of these interstate waters.

The interstate waters of the two rivers are used for fishing and boating and there is a potential use for water skiing.

The Pearl River was polluted for approximately 26 miles below the mouth of Bogue Lusa Creek. The source of this pollution was the untreated sewage from the City of Bogalusa, Louisiana, and the wastes from the integrated kraft pulp and paper mill operated by the Bogalusa Division of the Crown Zellerbach Corporation.

The bacterial pollution in the raw sewage from the City attained densities 168 times the accepted maximum value for water contact sports and nearly 34 times that for general recreation. The solids in the sewage would have created an unsightly condition in the stream but the contribution from the city was far overshadowed by the wastes discharged from the pulp and paper mill.

The lost fiber from the mill had created a mound of material at the mouth of Bogue Lusa Creek. Other mill solids and fibers settled on the bottom of the river and the gases of decomposition bubbled to the water surface accompanied by partially decomposed sludge which floated on the surface of the water in clumps of assorted sizes. Oily wastes from the mouth of the creek clung to any object at the waterline, especially boats at Richardson's Landing. The oxygen-consuming wastes from the pulp and paper mill and the decomposing sludge above Pool's Bluff Sill lowered the D.O. in the water to average values of 4.0 mg/l during the survey. A value of 1.1 mg/l had been predicted for high temperature low flow periods and was subsequently observed by the Louisiana Stream Control Commission personnel in June, 1963.

The degradation of the stream, which was observed at the surface, was confirmed by biological investigations of the bottom of the stream where great numbers of a few types of pollutional tolerant worms were found.

The sedimentation provided above Pool's Bluff Sill and the reaeration of the water falling over the Sill, 9 miles below Bogue Lusa Creek, improved the appearance and dissolved oxygen of the stream below the Sill, but the biological investigations indicated that the stream did not show positive signs of recovery within 7 miles below the Sill, and not until it had flowed another 10 miles had the stream recovered from the wastes discharged from Bogue Lusa Creek. A minimum average D.O. of 5.3 mg/l was observed 18 miles below the Sill and a minimum average value of 4.6 mg/l is to be expected at lower stream flows, with similar waste loads.

On the East Pearl River the intrastate waters in Hobolochitto Creek were polluted by the waste discharges from Crosby Chemicals, Inc. The D.O. was reduced to an average value of 2.5 mg/l during the survey and the biological samples showed distinct adverse effects from pollution.

The interstate waters of the East Pearl River started to recover from the industrial pollution above Jackson's Landing but the raw sewage discharged to the river below Jackson's Landing by the City of Picayune, Mississippi, developed bacterial densities in the river 120 times the maximum value acceptable for water contact sports, and 24 times that for general recreation.

A discharge or discharges from Crosby Chemicals, Inc. on or about September 26, 1962, killed great numbers of fish in Hobolochitto Creek and in at least 17 miles of interstate water. Bottom organisms were also reduced to only a few tolerant species.

It is concluded that:

1. Untreated municipal sewage discharged by the Cities of Bogalusa, Louisiana, and Picayune, Mississippi, endangers the health or welfare of persons in Mississippi and Louisiana.
2. Pulp and paper mill wastes discharged by the Bogalusa Division of the Crown Zellerbach Corporation endangers the health or welfare of persons in Mississippi.
3. Industrial wastes discharged by Crosby Chemicals, Inc. endanger the health or welfare of persons in Louisiana.
4. This pollution of interstate waters is subject to abatement under the Federal Water Pollution Control Act.

APPENDICES

SUPPLEMENTARY REPORT ON UPPER PEARL RIVER

BACKGROUND

PREVIOUS SURVEYS

A series of surveys were made on the Pearl River by the Mississippi Game and Fish Commission between April 1959 and September 1960 and reported April 30, 1961.[10]

"Oxygen concentrations were in the desirable range for normal aquatic life at all stations on the sampling dates except the ones immediately below the Jackson area." The results of the bottom sampling substantiated the contention that septic zones existed at stations below Jackson, and the river was recovering from pollution at the Byram bridge. The only station on the river below Bogalusa, Louisiana, was at Upper Walkiah Bluff.[10]

PRESENT SURVEY

Chemical and bacteriological samples were collected and analyzed by the Mississippi State Board of Health during the period September 17 to 28, 1962, from above the city of Jackson, Mississippi, to about 100 miles below the City (P183), and from the mouth of the Strong River. Samples were collected during the same period above and below Columbia, Mississippi, by the local sanitarian and shipped to the U. S. Public Health Service trailer at Bogalusa, Louisiana for analysis.

THE AREA

The economy of the Pearl River watershed is based on various forms of agriculture. On the rolling hills beef and dairy cattle are grazed, and some corn and cotton is grown. Most of the land, hills and river bottoms, is in forests which produce marketable timber for lumber and pulp wood. The major manufacturing center is the Jackson Metropolitan Area.

The Upper Pearl is shown on Figure 20.

WATER USES

WATER SUPPLY

The City of Jackson, Mississippi, obtains a municipal water supply from the Pearl River above a low-head dam, upstream from the city. This is the only known source of drinking water on the entire river system.

RECREATION

The Pearl River System is used throughout its length as a fishing stream.

STOCK WATERING

Dairy cattle are excluded from the stream and watered at farm ponds and from wells. Some stock are allowed to graze in the woods of the river bottoms and have access to the stream particularly in the upper reaches where the forest is not so heavy.

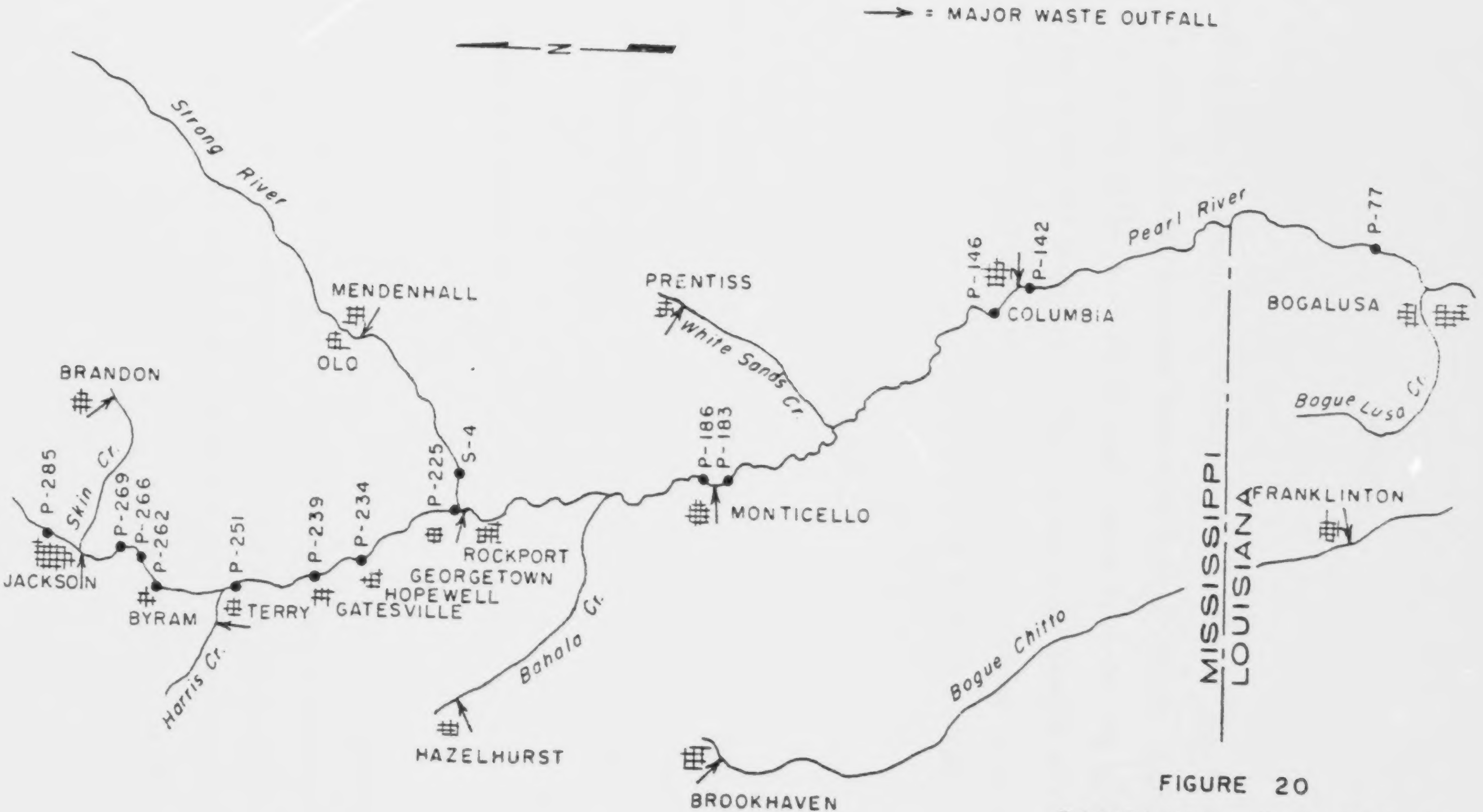
= MAJOR WASTE OUTFALL
N
Strong River
MENDENHALL
OLO
BRANDON
P-285
Skin Cr.
P-269
P-266
P-262
JACKSOIN
BYRAM
P-251
TERRY
Harris Cr.
P-239
P-234
GATESVILLE
HOPEWELL
GEORGETOWN
P-225
S-4
ROCKPORT
Bahala Cr.
HAZELHURST
P-186
P-183
MONTICELLO
PRENTISS
White Sands Cr.
P-146
P-142
COLUMBIA
Pearl River
P-77
BOGALUSA
Bogue Lusa Cr.
MISSISSIPPI
LOUISIANA
FRANKLINTON
Bogue Chitto
BROOKHAVEN

FIGURE 20

SAMPLING STATIONS
UPPER PEARL RIVER
MISSISSIPPI – LOUISIANA

SOURCES OF WASTES

MUNICIPAL

The untreated sewage from the Jackson Metropolitan Area is discharged to the Pearl River from an estimated population of 150,000 people.

The untreated wastes from an estimated population of 1400 people at Monticello are discharged to the Pearl River. At Columbia the garbage and refuse from the community are dumped on the banks of the stream above the city and the refuse is encroaching on the stream. The City of Columbia has seven different outlets to the stream through which untreated sewage is discharged. There is a sewage lagoon under construction by force account which will serve approximately 25 percent of the estimated population of 6,000.

INDUSTRIAL WASTES

The industrial wastes from the Jackson Metropolitan Area were not segregated from the municipal wastes in the sampling program. One industry, the Filtros Corporation, is known to be lagooning some acid wastes before discharging them to the stream.

PRESENTATION OF DATA

GENERAL

Tabulated chemical and bacteriological data are presented in Appendix A, and tabulated biological data are presented in Appendix B. Summarized data are presented in this section of the report in various graphical forms.

Sampling stations occupied during this survey for the collection of chemical and bacteriological data are listed in Table 5. Stations occupied for the collection of biological samples and observations were at these same stations or intermediate points.

A summary of stream flow data is presented in Table 6. Stream flows were reasonably uniform during the period of sampling, and were well below the average flows for the streams involved, but were not down to minimum stream flows.

The concentration or amount of organic pollutional material being discharged to the stream or observed in the stream is expressed as 5-day B.O.D. (biochemical oxygen demand) and is generally referred to simply as B.O.D. in this report. The primary effect on the stream of this organic pollutional material is observed as D.O. (dissolved oxygen).

PEARL RIVER SURVEY - MISSISSIPPI

SAMPLING STATIONS FOR CHEMICAL AND BACTERIOLOGICAL SAMPLES

TABLE NO. 5

STATION NUMBER	RIVER MILES	LOCATION	TYPE OF SAMPLE	IMMEDIATE UPSTREAM WASTE
		STRONG RIVER (River Mile 223.1)		
S 4	4.2	Bridge on County Road	Bridge	None
		UPPER PEARL RIVER		
P285	284.8	Low-head dam at City of Jackson water plant	Bank	None
P269	269.4	End of Elton Road off U. S. 51, Hinds County, Miss.	Bank	City of Jackson
P266	265.6	Wansley's farm, Rankin County, Miss. Sect. line 15-16, T.4 N., R.1 E.	Bank	" "
P262	261.9	Bridge near Byram, Miss.	Bridge	" "
P251	251.5	Bridge near Terry, Miss.	Bridge	" "
P239	239.0	Bridge near Gatesville, Miss.	Bridge	" "
P234	234.4	Bridge near Hopewell, Miss.	Bridge	
P225	225.1	Bridge on State Hwy. 28 at Georgetown, Miss.	Bridge	
P186	186.2	Opposite school, Monticello, Miss.	Bank	None
P183	183.2	Ward's farm, Lawrence County, Miss.	Bank	Monticello, Miss.
P146	146	Chamber of Commerce property	Boat	None
P142	142	Near public school property	Boat	City of Columbia
P142	141	Pittman property	Boat	" "

PEARL RIVER SURVEY - MISSISSIPPI

STREAM FLOWS IN CUBIC FEET PER SECOND

TABLE NO. 6

Gaging Station	Avg. Daily	Min. of Record	Sept. 11 - 30, 1962 Avg.	Min.	Max.
PEARL RIVER					
Jackson, Miss.	3786	78	232	141	364
Monticello, Miss.	6188	289	580	458	839
Columbia, Miss.	7375	705	1099	858	1520
Bogalusa, La.	8909	1100	1947	1700	2310

In those reaches of the stream where the D.O. exceeds 5 mg/l, satisfactory stream conditions would be expected as far as dissolved oxygen is concerned. An indicator of pathogenic or disease-bearing bacteria and viruses was observed and reported as coliform concentration in terms of most probable number (MPN) per 100 ml. A more specific indicator of the source of bacteriological pollution involves bacteria specifically of fecal origin and is expressed in terms of MPN of fecal coliforms per 100 ml. For water contact sports the total coliform concentration should not exceed 1,000 MPN, and for general recreational use and surface water supplies where adequate water treatment plants are in use the total coliform concentration should not exceed 5,000 MPN, according to public health authorities.

The general location of sampling stations occupied on the Upper Pearl River during this survey are indicated in Figure 20, and chemical and bacteriological data are summarized in Figures 21, 22 and 23.

STRONG RIVER

Station S4 near the mouth of the Strong River was occupied in order to determine whether or not significant pollution was reaching the Pearl River from sources on the Strong River. Pollutional material being discharged from the Strong River was insignificant, especially in comparison with that existing in the Pearl River immediately above the mouth of the Strong River (P225).

JACKSON

Station P-285, which is the raw water intake for the City of Jackson, is an example of a clean stream station on the Pearl River and serves as a base line for the Upper Pearl.

For the first four stations below the City of Jackson there was not any dissolved oxygen present in some samples during the survey, and for the first station below Jackson the presence of dissolved oxygen was never observed. For the first three of these four stations the average coliform density was from two to more than seven million MPN/100 ml. In a previous survey[10] it was indicated that the major pollutional load for the Pearl River was derived from the City of Jackson. The City of Jackson is still the major pollutional load on the Pearl River within the State of Mississippi.

The number of bottom dwelling species was reduced to four immediately below Jackson compared with 28 species immediately above Jackson.[10] The species below Jackson were two types of sludgeworms, a leech, and an aquatic moth. This degraded river bottom was "outlined" with a red border of sludgeworms along the river banks for 20 miles below Jackson and sludgeworms numbers 21,000 per square foot. With the exception of gar, no fish were found in this previous survey immediately below Jackson. Even 20 miles below Jackson the fish population was not yet normal compared with the normal fish population of the river. The pollutional influence on fisheries was estimated to extend for 40 to 60 miles below Jackson, which would be below the mouth of the Strong River (P-225).[10]

TERRY

The first four stations below Jackson included that reach of the river down to Terry, Mississippi. The next three stations below Terry, which is down to the mouth of the Strong River and includes Station P-225, are in the reach of the Pearl River which is recovering from the heavy pollutional effects originating in Jackson; the concentration of B.O.D. continues to be reduced, the dissolved oxygen is on the increase, and the coliform concentration continues to decrease as the bacteria die off.

MONTICELLO

From the observations made at the sampling stations above and below Monticello it does not appear that the oxygen was adversely affected by any wastes discharged at Monticello. However, there was an appreciable increase in coliform concentration.

COLUMBIA

The samples collected above and below Columbia showed a very substantial increase in coliform densities below Columbia. No significant pollutional influence on the biology of the stream was observed above (1.5 miles) or below (5.0 miles) Columbia.

The utilization of the stream's banks as a "town dump" by the City of Columbia does not seriously influence the biota of the stream. The major detriment of this dump is its effect on the aesthetic and recreational value of the stream. These effects are not confined to the immediate vicinity of the dump, but are obvious downstream. Trash, in its many forms, is transported by the river, especially during high water periods, and deposited downstream on the river bottom, along the bank, and suspended in low hanging trees and brush.

EFFECTS OF WASTES ON WATER QUALITY

The wastes discharged to the Pearl River from the Jackson Metropolitan Area degrade the stream between Jackson and Terry to such an extent that legitimate use of the water is prevented or is extremely hazardous to human beings. In the recovery zone between Terry and the mouth of the Strong River, legitimate use is still restricted and the stream never returns to a quality equal to that above Jackson. It is regrettable that in a densely populated part of the state the principal stream is not useable for recreation, and is unable to support a normal fish population.

The wastes discharged by other communities along the Upper Pearl pollute the stream with bacteria for short reaches so that water contact sports would be hazardous to human beings. Aquatic life is apparently not affected.

APPENDIX A

CHEMICAL AND BACTERIOLOGICAL DATA

APPENDIX A

CHEMICAL AND BACTERIOLOGICAL DATA

SAMPLING

The location of sampling stations and type of sample or means of sampling is indicated in Table 1.[5] Samples taken from a bridge were generally taken at midstream. Bank samples were taken as far from the bank as physically possible by reaching and/or stepping on projections from the bank. Samples were not taken from slack water. Boat samples were taken anywhere from one boat length from the bank to midstream.

Samples for D.O. determinations were taken approximately 3 feet below the surface with a submerged dissolved oxygen sampler. Samples for B.O.D. determinations were taken with an open bottle approximately 3 feet below the surface. Bacteriological samples were taken at or near the surface in sterile bottles. Samples for other chemical analyses were taken in a manner similar to those for B.O.D. determinations. Samples for D.O., B.O.D., and bacteriological samples were iced immediately and delivered to the laboratories in iced containers.

Samples from Stations P-285 to and including P-183 were collected and analyzed by the Mississippi State Board of Health laboratory at Jackson, Mississippi. Samples from Stations P-146 and P-142 were collected and shipped by bus to Bogalusa. Samples from Stations P-77 to WP-8 and H-16 to EP-5 were collected and analyzed by the U. S. Public Health Service trailer laboratory at Bogalusa. Samples from Station EP-4 to S-10 as shown in Figure 21 were collected and analyzed by the laboratory at Gulfport, Mississippi.

Maximum time from collection to delivery at the laboratory was six hours. Date and time of collection is recorded in Tables A1 to A24 inclusive.

TABLE A-1 - UPPER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P285 - Low-head dam at City of Jackson water plant																				
17SEP62	1130A	218	4.6	28	58	5.4	0.8	0.9	170	2	170	7.0			19	23	155			
18SEP62	1200N	228	5.0	27	62	6.1	0.6	0.7	130	2	130	6.8			20	28	135	40		
19SEP62	115P	34[illegible]	6.0	27	74	11.1	0.8	1.5	23	0	23	7.1			19	19	55			
20SEP62	1215P	364	6.0	27	74	11.8	0.8	1.6	79	2	23	6.9			16	17	30	35		
21SEP62	130P	316	6.6	27	82	11.2	1.6	2.7	220	4	49	7.1			16	20	25			
24SEP62	1210P	203	6.0	27	74	6.6	0.6	0.7	23	0	23	6.6			16	16	25	35		
25SEP62	1200N	193	6.0	25	72	5.9	0.8	0.8	76	1	2	6.9			17	22	25			
26SEP62	1140A	169	5.6	27	69	5.1	0.4	0.4	23	0	23	7.1			19	24	20	30		
27SEP62	1210P	160	5.8	26	71	5.0	0.6	0.5	79	1	7	7.1			18	18	20			
28SEP62	1200N	146	5.8	25	62	4.1	0.4	0.3	350	3	350	7.0			15	18	10	35		
	Avg.	233	5.7	27	70	7.2	0.7	1.0	117	2	80	7.0			18	20	50	35		
	Max.	364	6.6	28	82	11.8	1.6	2.7	350	4	350	7.1			20	28	155	40		
	Min.	146	4.6	25	62	4.1	0.4	0.3	23	0	2	6.6			15	16	10	30		
	R	218	2.0	3	20	7.7	1.2	2.4	327	4	348	0.5			5	12	145	10		
	n	10	10	10	10	10	10	10	10	10	10	10			10	10	10	5		
P269 - End of Elton Road off U.S. 51, Hinds County, Miss.																				
17SEP62	1040A	240	0.0	28	0	0.0	16.0	20.7	5400000	79315	5400000	6.6			41	39	350			
18SEP62	1130A	250	0.0	27	0	0.0	17.0	22.9	9200000	140760	2400000	6.8			45	34	150	35		
19SEP62	1048A	369	0.0	27	0	0.0	14.0	27.8	5400000	121947	2400000	7.2			36	32	200			
20SEP62	1130A	389	0.0	27	0	0.0	10.0	21.0	2400000	57136	2400000	7.3			31	28	135	35		
21SEP62	1135A	347	0.0	27	0	0.0	14.0	26.2	2400000	50967	2400000	7.3			28	29	60			
24SEP62	1115A	222	0.0	27	0	0.0	6.6	7.9	920000	12499	920000	6.9			32	24	45	35		
25SEP62	1100A	202	0.0	25	0	0.0	10.0	10.9	5400000	66757	3500000	7.1			41	29	30			
26SEP62	1130A	184	0.0	27	0	0.0	14.6	14.5	540000	6081	540000	7.1			43	31	20	35		
27SEP62	1115A	174	0.0	26	0	0.0	18.0	16.9	24000000	255571	24000000	7.1			46	29	25			
28SEP62	1120A	163	0.0	25	0	0.0	13.3	11.7	16000000	159610	16000000	7.2			48	30	10	35		
	Avg.	254	0.0	27	0	0.0	13.4	18.0	7166000	95064	5996000	7.1			39	30	102	35		
	Max.	389	0.0	28	0	0.0	18.0	27.8	24000000	255571	24000000	7.3			48	39	350	35		
	Min.	163	0.0	25	0	0.0	6.6	7.9	540000	6081	540000	6.6			28	24	10	35		
	R	226	0	3	0	0.0	11.4	19.9	23460000	249490	23460000	0.7			20	15	340	0		
	n	10	10	10	10	10	10	10	10	10	10	10			10	10	10	5		
P266 - Wansley's farm, Rankin County, Miss.																				
17SEP62	840A	244	0.0	28	0	0.0	9.0	11.8	130000	1941	49000	7.1			45	38	20			
18SEP62	915A	254	0.0	27	0	0.0	5.0	6.8	350000	5441	240000	7.1			41	36	160	40		
19SEP62	830A	374	0.0	27	0	0.0	8.0	16.1	9200000	210577	5400000	7.2			41	34	129			
20SEP62	915A	394	0.0	27	6	1.1	8.0	17.0	5400000	130209	3500000	7.5			34	31	75	40		
21SEP62	920A	352	0.0	27	0	0.0	12.0	22.8	240000	5170	130000	7.5			38	30	75			
24SEP62	830A	225	0.0	27	0	0.0	3.0	3.6	79000	1088	79000	7.0			32	25	15	40		
25SEP62	845A	205	0.0	25	0	0.0	6.0	6.6	79000	991	49000	7.2			34	28	15			
26SEP62	830A	186	0.0	27	0	0.0	5.3	5.3	350000	3984	350000	7.3			41	29	20	35		
27SEP62	825A	177	0.0	26	0	0.0	8.0	7.6	5400000	58495	1400000	7.2			40	30	20			
28SEP62	820A	166	0.0	25	0	0.0	8.3	7.4	5400000	54660	3500000	7.1			43	31	10	40		
	Avg.	258	0.1	27	1	0.1	7.3	10.5	2662800	47276	1469700	7.2			38	31	54	39		
	Max.	394	0.5	28	6	1.1	12.0	22.8	9200000	210577	5400000	7.5			45	38	160	40		
	Min.	166	0.0	25	0	0.0	3.0	3.6	79000	991	49000	7.0			32	25	10	35		
	R	228	0.5	3	6	1.1	9.0	19.2	9121000	209586	5351000	0.5			13	13	150	5		
	n	10	10	10	10	10	10	10	10	10	10	10			10	10	10	5		

TABLE A-2 - UPPER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P262 - Bridge near Byram, Miss.																				
17SEP62	930A	250	0.0	24	0	0.0	3.0	4.0	240000	7672	130000	7.1			43	36	20			
18SEP62	1015A	260	1.0	27	12	1.4	3.2	4.5	350000	5569	110000	7.1			46	42	155	43		
19SEP62	915A	380	0.0	27	0	0.0	5.0	10.2	2400000	55814	2400000	7.5			45	34	120			
20SEP62	945A	400	0.8	27	10	1.7	5.0	10.8	540000	13219	79000	7.3			35	32	60	35		
21SEP62	1010A	360	0.8	27	10	1.6	6.5	12.6	11000	242	3300	7.2			36	28	20			
24SEP62	1000A	230	0.6	27	7	0.7	4.0	5.0	92000	1295	92000	7.2			35	27	15	35		
25SEP62	940A	210	0.6	29	7	0.7	4.0	4.5	54000	694	35000	7.2			35	28	15			
26SEP62	1045A	190	0.4	27	5	0.4	8.5	8.7	2400000	27907	2400000	7.3			44	30	20	35		
27SEP62	1050A	180	0.4	26	5	0.4	13.5	13.1	16000000	176256	9200000	7.2			48	31	20			
28SEP62	1030A	170	0.0	25	0	0.0	12.6	11.5	920000	9572	920000	7.2			51	34	10	40		
	Avg.	263	0.5	27	6	0.7	6.5	8.5	2300700	29424	1536930	7.2			42	32	46	38		
	Max.	400	1.0	28	12	1.7	13.5	13.1	16000000	55814	9200000	7.5			51	42	155	45		
	Min.	170	0.0	25	0	0.0	3.0	4.0	11000	242	3300	7.1			35	27	10	35		
	R	230	1.0	3	12	1.7	10.5	9.1	15989000	55572	9196700	0.4			16	15	145	10		
	n	10	10	10	10	10	10	10	10	10	10	10			10	10	10	5		
P251 - Bridge near Terry, Miss.																				
17SEP62	1000A	260	0.0	29	0	0.0	3.0	4.2	35000	557	11000	7.1			37	34	20			
18SEP62	1045A	270	2.8	27	35	4.1	4.0	5.8	54000	892	14000	7.3			42	34	25	30		
19SEP62	1000A	390	3.0	27	37	6.3	5.0	10.5	35000	835	24000	7.6			46	32	35			
20SEP62	1015A	420	1.2	27	15	2.7	7.0	15.8	350000	8996	54000	7.6			46	33	40	35		
21SEP62	1040A	370	1.8	27	22	3.6	5.0	10.0	7900	179	7900	7.7			35	35	25			
24SEP62	1030A	240	1.4	27	17	1.8	4.0	5.8	43000	432	43000	7.3			38	28	15	35		
25SEP62	1045A	220	1.3	25	21	2.1	3.2	3.8	3100	42	3100	7.3			35	29	15			
26SEP62	915A	200	1.0	27	12	1.1	3.5	3.8	24000	294	13000	7.3			36	26	20	35		
27SEP62	900A	190	2.2	26	27	2.3	2.5	2.6	35000	407	24000	6.8			35	27	20			
28SEP62	910A	180	1.4	25	17	1.4	3.5	3.4	350000	3856	350000	7.2			43	31	10	35		
	Avg.	274	1.7	27	20	2.5	4.1	6.5	93700	1669	54400	7.3			40	31	22	34		
	Max.	420	3.0	28	37	6.3	7.0	15.8	350000	8996	350000	7.7			46	39	40	35		
	Min.	180	0.0	25	0	0.0	2.5	2.6	3100	42	3100	6.8			35	26	10	30		
	R	240	3.0	3	37	6.3	4.5	13.2	346900	8954	346900	0.9			11	13	30	5		
	n	10	10	10	10	10	10	10	10	10	10	10			10	10	10	5		
P239 - Bridge near Gatesville, Miss.																				
17SEP62	1145A	260	4.7	28	59	6.6	5.1	7.1	2300	37	2300	7.0			34		10			
18SEP62	1010A	270	2.3	27	28	3.3	3.2	4.7	4900	81	2220	7.1			47		5	35		
19SEP62	1220P	390	5.0	27	62	10.5	5.2	10.9	3480	83	1300	7.0			35		5			
20SEP62	930A	430	4.7	27	58	10.9	6.2	14.4	1300	34	2400	6.9			35		5			
21SEP62	1000A	380	2.8	27	35	5.7	3.3	6.8	5420	126	2400	7.0			43	40	30	50		
24SEP62	1230A	250	4.4	27	55	5.9	3.6	4.9	1410	22	40	7.0			28	28	10	35		
25SEP62	1040A	220	3.9	25	47	4.6	4.5	5.3	3480	47	1090	7.0			48	28	10			
26SEP62	1230P	200	4.4	27	55	4.7	5.9	6.4	3480	43	330	7.1			38		10	35		
27SEP62	1230P	190	5.2	24	63	5.3	5.3	5.4	5420	63	460	6.7			35		10	35		
28SEP62	950A	180	4.7	25	56	4.6	4.9	4.8	3480	38	230	6.6			27	27	10	30		
	Avg.	277	4.2	27	52	6.2	4.7	7.1	3467	57	1275	6.9			37	31	10	37		
	Max.	430	5.0	28	63	10.9	6.2	14.4	5420	126	2400	7.1			48	40	30	50		
	Min.	180	2.3	25	28	3.3	3.2	4.7	1300	22	40	6.6			27	27	5	30		
	R	250	2.7	3	35	7.6	3.0	9.7	4120	104	2360	0.5			21	13	25	20		
	n	10	10	10	10	10	10	10	10	10	10	10			10	4	10	6		

TABLE A-3 - UPPER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P234 - Bridge near Hopewell, Miss.																				
18SEP62	1030A	270	4.4	27	55	6.4	5.0	7.3	490	8	40	7.1			14		5	40		
19SEP62	1150A	400	3.9	27	48	8.4	5.2	11.2	1720	42	490	7.2			47		5			
20SEP62	930A	430	3.9	28	49	9.0	5.9	13.7	2210	58	130	6.9			37		5			
21SEP62	1030A	390	5.4	28	68	11.4	6.5	13.7	460	11	230	6.9			40	38	25	45		
24SEP62	1120A	250	5.2	27	64	7.0	5.6	7.5	2210	34	230	7.2			40	27	10	30		
25SEP62	1015A	220	4.2	25	50	5.0	4.4	9.2	5420	73	230	7.2			37	31	5			
26SEP62	1200N	200	5.0	27	62	5.4	5.2	9.6	5420	66	450	7.2			33		10	35		
27SEP62	1200N	190	4.6	26	56	4.7	4.1	4.2	1300	15	230	6.7			38		10	30		
28SEP62	930A	180	4.7	25	56	4.6	5.3	5.1	1720	19	230	6.5			35	25	10	30		
	Avg.	281	4.6	27	56	6.9	5.2	8.2	2328	36	256	7.0			36	30	9	35		
	Max.	430	5.4	28	68	11.4	6.5	13.7	5420	73	490	7.2			47	38	25	45		
	Min.	180	3.9	25	48	4.6	4.1	4.2	460	8	40	6.5			14	25	5	30		
	R	250	1.5	3	20	6.8	2.4	9.5	4960	65	450	0.7			33	13	20	15		
	n	9	9	9	9	9	9	9	9	9	9	9			9	4	9	6		
P225 - Bridge on State Hwy. 28 at Georgetown, Miss.																				
17SEP62	1115A	310	2.9	28	35	4.7	4.4	7.7	790	15	40	7.5			9					
18SEP62	1100A	280	3.0	28	45	5.8	2.9	4.8	400	7	200	7.3			37		5	39		
19SEP62	1110A	410	3.6	28	45	8.0	4.3	9.3	60	2	20	7.3			39		5			
20SEP62	1000A	440	3.2	28	40	7.6	5.7	13.5	2400	65	2400	7.1			37		5			
21SEP62	1110A	400	3.8	27	47	8.2	3.2	6.9	1410	35	490	7.0			40	39	25	30		
24SEP62	1030A	260	2.7	27	33	3.8	3.3	4.6	2400	38	2400	7.0			40	35	10	40		
25SEP62	900A	230	2.7	25	32	3.3	3.1	3.8	3480	49	230	7.0			45	37	5			
26SEP62	1050A	210	3.1	27	38	3.5	4.0	4.5	5420	70	490	7.2			36		10	30		
27SEP62	1130A	200	3.3	26	40	3.6	2.9	3.1	400	5	40	6.5			39		10	25		
28SEP62	840A	190	2.1	25	25	2.2	1.8	1.8	1720	20	230	6.4			33		10	25		
	Avg.	293	3.1	27	38	5.0	3.6	6.0	1848	31	655	7.0			35	37	9	32		
	Max.	440	3.8	28	47	8.2	5.7	13.5	5420	70	2400	7.5			45	39	25	40		
	Min.	190	2.1	25	25	2.2	1.8	1.8	60	2	20	6.4			9	35	5	25		
	R	250	1.7	3	22	6.0	3.9	11.7	5360	68	2380	1.1			36	4	20	15		
	n	10	10	10	10	10	10	10	10	10	10	10			10	3	9	6		
P186 - Opposite school above Monticello, Miss.																				
17SEP62	1000A	789	5.5	28	69	23.4	2.0	6.5	200	10	200	7.1			13		20			
18SEP62	1230P	693	7.8	28	98	29.1	1.7	6.3	230	10	230	7.4			17		5	30		
19SEP62	1030A	594	7.1	28	90	22.7	2.2	7.0	220	8	790	7.3			17		5			
20SEP62	1110A	542	8.3	29	107	24.2	3.9	11.6	460	15	310	6.9			22		10			
21SEP62	1140A	534	8.4	27	104	24.2	2.9	9.3	110	4	110	6.9			23	25	35	25		
24SEP62	945A	572	9.2	27	114	28.4	3.8	11.7	3480	122	2400	7.1			28	25	2	35		
25SEP62	830A	534	9.2	25	110	24.3	3.8	10.9	5420	177	230	7.2			14	30	5			
26SEP62	1015A	506	8.8	27	100	24.0	3.0	8.2	5420	164	3480	7.2			26		5	35		
27SEP62	1045A	490	8.7	26	106	23.0	2.8	7.6	1410	42	230	6.4			34		2	30		
28SEP62	800A	483	7.8	25	93	20.3	2.7	7.0	2120	63	790	6.4			29	22	2	35		
	Avg.	574	8.1	27	100	24.6	2.9	8.7	1907	62	877	7.0			22	26	9	32		
	Max.	789	9.2	29	114	29.1	3.9	11.7	5420	177	3480	7.4			34	30	35	35		
	Min.	483	5.5	25	69	20.3	1.7	6.3	110	4	110	6.4			13	22	2	25		
	R	306	3.7	4	45	8.8	2.2	5.4	5310	173	3370	1.0			21	8	33	10		
	n	10	10	10	10	10	10	10	10	10	10	10			10	4	10	6		

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TABLE A-4 - UPPER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E. COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P183 - Ward's farm, Lawrence County, Miss.																				
17SEP62	940A	789	6.4	28	81	27.2	1.9	8.1	11000	531	3100	7.3			14		20			
18SEP62	1255P	693	8.5	28	107	31.7	2.2	8.2	11000	467	1200	7.4			15		5	30		
19SEP62	1000A	594	7.2	28	91	23.1	2.1	6.7	1300	47	3300	7.2			17		5			
20SEP62	1130A	542	8.1	29	104	23.7	3.0	8.8	7000	232	7000	7.0			16		5			
21SEP62	1200N	534	7.6	27	94	21.9	3.8	10.9	4900	160	2200	7.0			23	21	20	20		
24SEP62	900A	572	9.0	26	110	27.7	3.2	9.9	3480	122	2400	7.3			21	22	2	35		
25SEP62	745A	534	7.7	25	92	22.2	3.4	9.8	17200	562	10900	7.2			19	29	2			
26SEP62	950A	506	7.8	27	97	21.3	2.6	7.1	4900	152	4900	7.3			30		5	35		
27SEP62	1015A	490	7.6	26	92	20.1	2.4	6.3	24000	720	3300	6.6			26		5	30		
28SEP62	730A	483	6.9	24	81	18.0	2.3	6.0	54200	1602	24000	6.6			27	25	2	30		
	Avg.	574	7.7	27	95	23.7	2.7	8.2	13898	460	6230	7.1			21	24	7	30		
	Max.	789	9.0	29	110	31.7	3.8	10.9	54200	1602	24000	7.4			30	29	20	35		
	Min.	483	6.4	24	81	18.0	1.9	6.0	1300	47	1200	6.6			14	21	2	20		
	R	306	2.6	5	29	13.7	1.9	4.9	52900	1555	22800	0.8			16	8	18	15		
	n	10	10	10	10	10	10	10	10	10	10	10			10	4	10	6		
P146 - Chamber of Commerce property above Columbia, Miss.																				
13SEP62	310P	1060	8.8	31	117	50.3	2.5	14.3	490	77	[illegible]	7.3								
17SEP62	125P	1510		30			1.7	13.8	1610	[illegible]	[illegible]	7.2			13	12	21	21		
18SEP62	155P	1320	8.6	29	111	61.2	3.2	22.8	4900	376	[illegible]	7.5								
19SEP62	1000A	1280	8.2	29	103	56.6	1.4	9.7	4000	396	[illegible]	7.0			14		20	22		
20SEP62	130P	1120	8.6	28	109	51.9	1.6	9.7	1720	114	[illegible]	6.9			16					
21SEP62	130P	1040	8.4	26	102	47.1	1.5	8.4	3300	210	110	6.4			14					
24SEP62	410P	1050	9.0	26	109	50.9	3.7	20.9	960	17	[illegible]	6.5			15					
25SEP62	150P	1050	9.0	26	109	50.9	1.9	10.8	170	11	[illegible]	6.5			18					
26SEP62	230P	1000	9.4	27	117	50.7	2.3	12.3	790	48	[illegible]	6.3			18		21	22		
27SEP62	140P	963	9.5	25	113	49.3	2.4	12.5	330	19	[illegible]	6.6			16					
28SEP62	140P	928	9.1	27	113	45.5	2.4	12.0	490	78	[illegible]	6.7			16					
	Avg.	1120	8.9	28	110	51.4	2.2	13.4	1705	127	48	6.8			16	12	21	22		
	Max.	1510	9.5	31	117	61.2	3.7	22.8	4900	396	110	7.5			18	12	21	22		
	Min.	928	8.2	25	102	45.5	1.4	8.4	170	11	20	6.3			13	12	20	21		
	R	582	1.3	6	15	15.7	2.3	14.4	4730	385	90	1.2			5	0	1	1		
	n	11	10	11	10	10	11	11	11	11	11	11			9	1	3	3		
P142 - Near public school property below Columbia, Miss.																				
13SEP62	420P	1060	8.7	31	116	49.7	2.7	15.4	240000	15569	49000	7.1								
17SEP62	230P	1510		30			1.7	13.8	172000	15895	46000	7.1			12	12	20	22		
18SEP62	320P	1320	8.6	30	113	61.2	3.0	21.3	17200	1269	3300	7.4								
19SEP62	1245A	1280	8.2	30	107	56.6	1.4	9.7	49000	[illegible]	7700	6.4			15		15	22		
20SEP62	215P	1120	8.6	28	109	51.9	2.0	12.1	13000	891	4300	6.9			14					
21SEP62	230P	1040	8.8	27	108	49.3	1.6	9.0	33000	2100	2700	7.0			18					
24SEP62	330P	1050	9.1	27	113	51.5	2.4	13.6	9400	674	3100	6.7			14					
25SEP62	230P	1050	9.4	26	114	53.2	2.0	11.3	7900	508	4900	6.7			16					
26SEP62	150P	1000	9.0	27	112	48.5	2.0	10.8	13000	796	1700	6.5			14		22	21		
27SEP62	230P	963	9.7	27	121	50.3	2.1	10.9	33000	1345	3300	6.5			18					
28SEP62	230P	928	9.8	27	121	49.0	3.6	18.0	33000	1874	7900	6.6			18					
	Avg.	1120	9.0	28	113	52.1	2.2	13.3	56409	4126	12245	6.8			15	12	19	22		
	Max.	1510	9.7	31	121	61.2	3.6	21.3	240000	15895	49000	7.4			18	12	22	22		
	Min.	928	8.2	26	107	48.5	1.4	9.0	7900	508	1700	6.4			12	12	15	21		
	R	582	1.5	5	14	12.7	2.2	12.3	232100	15387	47300	1.0			6	0	7	1		
	n	11	10	11	10	10	11	11	11	11	11	11			9	1	3	3		

TABLE A-5 - UPPER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000 lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
S4 - Bridge on County Road near mouth of river																				
17SEP62	1105A	56	6.9	26	84	2.1	0.6	0.2	1700	6	460	7.5			10		3			
18SEP62	1130A	49	7.3	26	89	1.9	0.4	0.1	1720	5	440	7.2			10		3	30		
19SEP62	1130A	46	7.2	27	89	1.8	2.2	0.5	1300	4	790	7.1			10		2			
20SEP62	1015A	44	7.2	25	86	1.7	1.6	0.4	1200	3	460	7.2			10		2			
21SEP62	1050A	43	7.2	24	84	1.7	2.3	0.5	330	1	330	7.2			9	14	15	30		
24SEP62	1050A	40	7.6	24	89	1.6	1.1	0.2	2780	7	490	7.1			13	11	2	35		
25SEP62	920A	40	7.1	25	85	1.5	1.2	0.3	2210	5	1720	7.2			15	21	2			
26SEP62	1115A	39	7.2	26	88	1.5	1.4	0.3	3480	8	330	6.6			13		2	25		
27SEP62	1115A	40	7.6	24	89	1.6	0.6	0.1	1300	3	330	6.5			15		2	30		
28SEP62	900A	40	6.9	22	78	1.5	0.7	0.2	700	2	230	6.3			10	29	2	30		
	Avg.	44	7.2	25	86	1.7	1.2	0.3	1672	4	560	7.0			12	19	4	30		
	Max.	56	7.6	27	89	2.1	2.3	0.5	3480	8	1720	7.5			15	29	15	35		
	Min.	39	6.9	22	78	1.5	0.4	0.1	330	1	230	6.3			9	11	2	25		
	R	17	0.7	5	11	0.6	1.9	0.4	3150	7	1490	1.2			6	18	13	5		
	n	10	10	10	10	10	10	10	10	10	10	10			10	4	10	6		

TABLE A-6 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E. COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P77 - Drawbridge on Louisiana State Hwy. 10																				
11SEP62	1035A	2310	7.6	2?	96	94.6	2.2	33.6	1700	240	200	6.9								
12SEP62	1200P	2060	7.2	28	91	79.9	2.0	22.2	940	119	20									
13SEP62	1030A	2000	7.1	28	90	75.9	2.1	22.4	700	86	110	6.8								
14SEP62	1100A	1940	7.4	29	95	77.0	2.2	23.2	1920	206	20	7.0								
18SEP62	200P	1820	8.5	24	100	83.7	2.2	21.6	3300	358	20	7.2			14					
25SEP62	1015A	1820	7.9	23	91	77.5	1.5	14.7	1950	195	20	6.8			12					
26SEP62	930A	1820	7.5	23	89	76.5	1.7	16.2	1720	187	20	6.7			13		21	21		
27SEP62	1000A	1620	5.4	22	88	53.0	1.6	17.7	4630	546	20	6.6			12					
28SEP62	210P	1760	7.8	27	97	60.6	2.1	19.9	1720	145	170	6.9			12					
29SEP62	220P	1700	6.7	22	99	75.2	1.1	10.1	14100	1467	20	7.0			14					
	Avg.	1905	7.6	25	94	77.9	1.9	20.2	3855	360	62	6.9			13		21	21		
	Max.	2310	8.7	29	100	94.6	2.7	33.6	14100	1467	200	7.2			14		21	21		
	Min.	1700	5.4	22	88	53.0	1.1	10.1	700	86	20	6.7			12		21	21		
	R	610	3.3	7	12	41.6	1.6	23.5	13400	1381	180	0.5			2		0	0		
	n	10	10	10	10	10	10	10	10	10	10	10			6		1	1		
P76																				
17SEP62	340P	2140	7.8	27	100	91.7	2.1	24.7	13000	1734	330	6.9			12	15	33	23		
18SEP62	920A	2250	7.2	26	88	87.3	1.6	19.4	13000	1790	330	6.8								
19SEP62	915A	2160	7.2	26	97	84.8	2.0	23.3	3300	480	220	6.8			12		27	24		
20SEP62	445P	2060	8.1	29	97	89.9	1.7	14.9	13000	1639	50	7.0			12					
21SEP62	900A	1940	7.4	23	86	77.4	1.5	15.7	2300	273	230	6.9			13					
22SEP62	930A	1820	7.7	22	88	75.5	1.5	15.7	3300	368	170	6.8			13					
	Avg.	2072	7.6	25	91	84.4	1.8	19.6	7983	1041	223	6.8			12	15	30	24		
	Max.	2250	8.1	29	100	91.7	2.1	24.7	13000	1790	330	7.0			13	15	33	25		
	Min.	1820	7.2	22	86	75.5	1.5	15.7	3300	273	50	6.8			12	15	27	24		
	R	430	0.9	7	14	16.2	0.6	9.0	9700	1517	280	0.2			1	0	6	1		
	n	6	6	6	6	6	6	6	6	6	6	6			5	1	2	2		
P74 - Richardson's Landing below Bogue Lusa Creek																				
11SEP62	1110A	2366	7.2	28	91	91.8	3.0	38.3	33000	4774	13000	7.1								
12SEP62	940A	2114	4.4	27	55	50.1	7.3	83.2	79000	10221	23000	6.7								
13SEP62	1045A	2054	4.7	28	59	52.0	5.4	59.8	33000	4148	33000	6.7								
	Avg.	2178	5.4	28	68	64.6	5.2	60.4	48300	6382	23000	6.8								
	Max.	2366	7.2	28	91	91.8	7.3	83.2	79000	10221	33000	7.1								
	Min.	2054	4.4	27	55	50.1	3.0	38.3	33000	4148	13000	6.7								
	R	312	2.8	1	36	41.7	4.3	44.9	46000	6073	20000	0.4								
	n	3	3	3	3	3	3	3	3	3	3	3								
P71																				
11SEP62	1130A	2366	5.0	27	62	63.6	6.0	76.5	109000	15783	49000	6.7								
13SEP62	1115A	2054	4.2	28	53	46.5	5.0	55.4	79000	9931	49000	6.7								
14SEP62	915A	1994	4.4	27	55	47.3	7.4	79.5	79000	9641	17200	6.9								
17SEP62	240P	2238	5.2	27	64	62.7	5.4	65.1	109000	14929	49000	7.0			20	18	32	40		
18SEP62	955A	2306	4.8	26	59	59.7			79000	11149	33000	6.9								
19SEP62	935A	2236	5.0	26	61	60.3	4.9	59.1	94000	12663	31000	6.8			18		29	37		
20SEP62	400P	2112	5.2	26	64	60.3			49000	6333	33000	6.7			19					
21SEP62	900A	1990	5.2	24	61	55.8	5.2	55.8				6.9			20					
22SEP62	840A	1868	5.4	22	61	54.4	4.6	46.3	130000	14262	79000	6.6			20					
24SEP62	345P	1868	6.4	24	75	64.4	6.2	62.4	130000	14852	49000	6.9			20					
25SEP62	915A	1866	5.8	23	67	58.3	5.5	55.3	240000	27408	33000	6.9			18					
26SEP62	1015A	1966	5.5	24	64	55.3	5.5	55.3	348000	39741	49000	6.9			18		26	36		
27SEP62	855A	1864	5.4	22	62	50.3	5.6	56.3	130000	14830	21200	6.6			19					
29SEP62	235P	1804	6.2	22	71	60.3	5.7	55.8	230000	25393	49000	6.8			17					
27SEP62	145P	1744	6.2	22	71	58.3	6.9	64.9	109000	11634	49000	6.6			20					
	Avg.	2012	5.3	25	63	57.4	5.7	60.6	137000	16383	42171	6.8			19	18	29	38		
	Max.	2366	6.4	28	75	64.4	7.4	79.5	348000	39741	79000	7.0			20	18	32	40		
	Min.	1744	4.2	22	53	46.5	4.6	46.3	4900[illegible]	6333	17200	6.6			17	18	26	36		
	R	622	2.2	6	22	17.9	2.8	33.2	299[illegible]	33408	61800	0.4			3	0	6	4		
	n	15	15	15	15	15	13	13	[illegible]	14	14	15			11	1	3	3		

TABLE A-7 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P64 - Above Pool's Bluff Sill																				
11SEP62	1155A	2366	4.4	27	55	56.1	4.6	58.7	330000	47764	33000	6.9								
12SEP62	755A	2114	3.6	27	45	41.0	4.4	50.1	79000	10221	23000	6.4								
13SEP62	1130A	2054	3.5	28	44	38.7	4.7	52.0	79000	9931	49000	6.6								
14SEP62	845A	1994	3.0	28	37	32.2	5.0	53.7	79000	9641	49000	6.5								
17SEP62	1215P	2238	3.7	29	48	44.6	4.7	56.7	130000	17406	33000				19	16	29	39		
18SEP62	1015A	2306	3.8	26	46	47.2	4.5	55.9	240000	33071	49000	6.8								
19SEP62	1000A	2236	4.0	26	49	48.2	3.7	44.6	43000	5884	31000	6.7			18		27	33		
20SEP62	1230P	2112	3.7	24	45	42.1	4.1	46.7	109000	14089	49000	6.7			22					
21SEP62	1000A	1990	4.0	24	46	42.9	3.7	39.7	79000	9621	33000	6.9			20					
22SEP62	1010A	1868	4.0	24	47	40.3	4.2	42.3	348000	39746	46000	6.7			20					
24SEP62	405P	1868	5.2	24	62	52.4	4.9	49.3	221000	29265	23000	6.6			19					
25SEP62	855A	1866	4.6	23	52	46.3	5.2	52.3	240000	27408	33000	6.6			20					
26SEP62	1035A	1866	4.1	24	48	41.2	4.6	46.3	230000	24246	130000	6.6			18		18	35		
27SEP62	825A	1864	3.9	27	44	39.2	4.6	46.2	130000	14430	49000	6.5			20					
28SEP62	315P	1804	4.8	23	55	46.7	4.5	43.8	172000	14990	79000	6.7			18					
29SEP62	1140A	1744	4.4	22	50	41.4	4.4	41.4	172000	16354	130000	6.6			19					
	Avg.	2018	4.0	25	48	43.8	4.5	48.7	167562	20609	52438	6.7			19	16	25	36		
	Max.	2366	5.2	29	62	56.1	5.2	58.7	348000	47764	130000	6.9			22	16	29	39		
	Min.	1744	3.0	22	37	32.2	3.7	39.7	43000	5884	23000	6.5			18	16	18	33		
	R	622	2.2	7	25	23.9	1.5	19.0	305000	41900	107000	0.4			4	0	11	6		
	n	16	15	16	16	16	16	16	16	15	16	15			11	1	3	3		
P63-Below Pool's Bluff Sill																				
13SEP62	500P	2054	5.5	28	70	60.9	4.8	51.1	70000	8799	33000	6.7								
17SEP62	1140A	2238	4.9	29	63	59.1														
18SEP62	1045A	2306		29			4.6	57.2				6.7								
19SEP62	1010A	2236	5.6	26	68	67.5	3.7	44.5				6.7			18		25	34		
20SEP62	1150A	2112	5.1	26	62	58.1	3.9	44.6				6.6			17		21	38		
21SEP62	1010A	1990	5.6	24	66	60.1	3.8	40.8	109000	13275	79000	6.7			20					
22SEP62	1025A	1868	6.3	24	70	60.4	4.0	40.3				6.8			20					
24SEP62	415P	1868	6.6	24	77	66.3	4.7	47.3				6.4			20					
25SEP62	845A	1866	6.3	23	73	67.4	5.2	52.3				6.5			19					
26SEP62	1050A	1866	6.0	24	71	60.3	5.4	54.3				6.5			19					
27SEP62	815A	1864	6.2	22	70	62.3	3.7	37.2				6.7			20					
28SEP62	325P	1804	6.6	23	75	64.2	4.2	40.8				6.7			18					
29SEP62	1110A	1744	6.4	22	72	60.2						6.4								
	Avg.	1986	5.9	25	70	61.9	4.4	46.6	89500	11037	56000	6.7			19		23	36		
	Max.	2306	6.6	29	77	67.5	5.4	57.2	109000	13275	79000	6.8			20		25	38		
	Min.	1744	4.9	22	62	58.1	3.7	37.2	70000	8799	33000	6.4			17		21	34		
	R	562	1.7	7	15	9.4	1.7	20.0	39000	4476	46000	0.4			3		4	4		
	n	13	12	13	12	12	11	11	2	2	2	12			9		2	2		

TABLE A-8 – LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S mg/l
P60																				
17SEP62	1130A	2238	4.9	29	63	59.2														
18SEP62	200P	2306	5.9	27	66	67.2														
20SEP62	1105A	2112	5.0	26	61	57.0														
21SEP62	140P	1990	5.6	25	66	60.2														
22SEP62	345P	1868	5.8	24	69	58.5														
24SEP62	900A	1868	6.3	23	70	61.5														
25SEP62	500P	1866	5.8	24	69	58.4														
26SEP62	135P	1866	6.1	24	72	61.5														
27SEP62	430P	1864	6.1	24	71	61.4														
28SEP62	845A	1804	5.8	22	65	56.5														
29SEP62	1055A	1744	6.3	22	71	59.3														
	Avg.	1957	5.7	25	68	60.1														
	Max.	2306	6.3	29	72	67.2														
	Min.	1744	4.9	22	61	56.5														
	R	562	1.4	7	11	10.7														
	n	11	11	11	11	11														
P57																				
17SEP62	1115A	2238	5.0	29	64	62.3	3.7	46.6	49000	[illegible]	23000				21	16	26	40		
18SEP62	225P	2306	5.0	27	63	62.1	4.6	57.2	49000	[illegible]	23000	[illegible]								
20SEP62	1050A	2112	5.0	26	61	56.3	2.9	33.0	79000	10711	4900	[illegible]			18					
21SEP62	200P	1990	5.8	25	69	62.2	3.1	33.3	79000	[illegible]	[illegible]	[illegible]			22					
22SEP62	330P	1868	6.2	24	72	62.4	3.5	38.3	70000	[illegible]	33000	[illegible]			18					
24SEP62	920A	1868	5.8	23	67	59.4	5.9	59.4	70000	[illegible]	13000	[illegible]			19					
25SEP62	130P	1866	5.8	24	68	59.3			172000	[illegible]	33000	[illegible]								
26SEP62	155P	1866	6.3	24	74	63.4	4.5	49.3	49000	[illegible]	33000	[illegible]			17		17	40		
27SEP62	410P	1864	6.1	23	70	61.3	4.2	42.2	49000	[illegible]	33000	[illegible]			17					
28SEP62	925A	1804	5.7	22	65	55.4	3.6	39.0	159000	12034	33000	[illegible]			18					
29SEP62	1025A	1744	6.0	22	68	58.4	4.4	41.6	221000	23588	46000	[illegible]			18					
	Avg.	1957	5.7	24	67	59.7	4.1	43.0	90545	10538	27000	6.7			19	16	22	40		
	Max.	2306	6.3	29	74	63.4	5.9	59.4	221000	23588	46000	6.8			22	16	26	40		
	Min.	1744	5.0	22	61	55.4	2.9	33.0	49000	5590	4900	6.6			17	16	17	40		
	R	562	1.3	7	13	8.0	3.0	26.4	172000	17998	41100	0.2			5	0	9	0		
	n	11	11	11	11	11	10	10	11	11	11	10			9	1	2	2		
P53																				
17SEP62	1045A	2238	5.2	29	54	50.8														
18SEP62	245P	2306	5.1	27	63	63.5														
21SEP62	225P	1990	5.6	25	67	60.2														
22SEP62	250P	1868	6.1	25	73	61.5														
24SEP62	945A	1868	5.6	23	64	56.5														
25SEP62	415P	1866	6.1	24	72	61.5														
26SEP62	210P	1866	6.2	24	73	62.5														
27SEP62	350P	1864	6.0	24	70	60.4														
28SEP62	925A	1804	5.6	22	64	54.6														
29SEP62	1005A	1744	6.0	22	69	56.5														
	Avg.	1941	5.6	24	67	58.8														
	Max.	2306	6.2	29	73	63.5														
	Min.	1744	5.1	22	54	50.8														
	R	562	1.1	7	19	12.7														
	n	10	10	10	10	10														

TABLE A-9 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
P50																				
17SEP62	1030A	2238	3.9	28	50	47.0	3.6	43.8	49000	6711	7900				23	18	28	43		
18SEP62	300P	2306	5.0	28	63	62.1	3.8	47.2	31000	4375	23000	6.7								
20SEP62	955A	2112	4.8	26	58	54.6	2.5	28.5	22100	2857	4900	6.7			16					
21SEP62	300P	1990	5.6	25	67	60.1	3.2	34.3	7900	962	1700	6.7			20					
22SEP62	210P	1868	5.9	24	70	59.4	3.2	32.2	49000	5602	6300	6.7			18					
24SEP62	1005A	1868	5.6	23	64	54.4	5.0	50.3	70000	4003	13000	6.6			20					
25SEP62	350P	1866	5.9	24	69	59.3			49000	5596	17200	6.6								
26SEP62	230P	1866	6.2	24	73	62.4	3.7	37.2	23000	2627	13000	6.6			16		20	37		
27SEP62	330P	1864	6.1	24	71	61.3	3.5	36.2	33000	3765	7900	6.7			16					
28SEP62	945A	1804	5.5	23	63	53.5	2.8	27.2	13000	1435	3300	6.7			18					
29SEP62	940A	1744	6.0	22	66	56.4	3.5	32.9	49000	5238	17200	6.5			17					
	Avg.	1957	5.5	25	65	57.5	3.5	37.1	36000	4288	10491	6.7			18	18	24	40		
	Max.	2306	6.2	28	73	62.4	5.0	50.3	70000	8003	23000	6.8			23	18	28	43		
	Min.	1744	3.9	22	50	47.0	2.5	27.2	7900	962	1700	6.5			16	18	20	37		
	R	562	2.3	6	23	15.4	2.5	23.1	62100	7041	21300	0.3			7	0	8	6		
	n	11	11	11	11	11	10	10	11	11	11	11			9	1	2	2		
P46																				
13SEP62	330P	2054	5.4	29	67	57.8	3.1	34.3	7400	993	1100	6.7								
17SEP62	1000A	2238	3.8	28	48	45.8	3.0	36.2							22	18	27	45		
18SEP62	330P	2306	5.0	27	63	62.2	3.0	37.3	13000	1836	4900	6.9								
20SEP62	935A	2112	5.1	26	62	59.1														
21SEP62	330P	1990	5.3	25	63	56.8														
22SEP62	140P	1868	5.8	24	68	59.4														
24SEP62	1035A	1868	5.4	23	62	54.6														
25SEP62	325P	1866	5.9	24	70	59.3														
26SEP62	250P	1866	5.8	24	68	59.3														
27SEP62	305P	1864	5.6	24	66	56.3														
28SEP62	1015A	1804	5.1	23	59	49.6														
29SEP62	915A	1744	5.4	22	61	50.8														
	Avg.	1965	5.3	25	63	55.8	3.0	35.9	10450	1414	3000	6.8			22	18	27	45		
	Max.	2306	5.9	28	70	62.2	3.1	37.3	13000	1835	4900	6.9			22	18	27	45		
	Min.	1744	3.8	22	48	45.8	3.0	34.6	7900	993	1100	6.7			22	18	27	45		
	R	562	2.1	6	22	16.4	0.1	3.7	5100	842	3800	0.2			0	0	0	0		
	n	12	12	12	12	12	3	3	2	2	2	2			1	1	1	1		
P42 - Lower Wakiah Bluff																				
12SEP62	1030A	2114	5.4	29	68	61.5	3.0	34.2	13000	1682	1300	6.9								
13SEP62	310P	2054	5.4	29	68	59.8	3.4	37.6	9400	1182	500	6.7								
17SEP62	915A	2238	4.1	29	53	40.5	3.3	39.8	46000	6300	10700				22	17	32	40		
18SEP62	400P	2306	5.8	26	71	72.1	2.9	36.0	14100	1990	2200	6.7								
20SEP62	900A	2112	5.3	26	64	60.3			13000	1690	2300	6.6			17					
21SEP62	355P	1990	5.9	25	70	63.3	2.5	26.8	2300	280	500	6.6			22					
22SEP62	110P	1868	6.1	24	72	61.6	2.9	29.2	24000	2744	4900	6.7			18					
24SEP62	1105A	1868	5.4	24	63	54.6	3.7	37.3	24000	2744	13000	6.7			19					
25SEP62	300P	1866	6.0	24	70	60.3			160000	18272	4600	6.7								
26SEP62	320P	1866	5.6	24	66	56.3	3.1	31.2	94200	4190	4900	6.7			18		20	38		
27SEP62	240P	1864	5.8	24	68	59.3	3.0	30.1	17200	1962	3300	6.8			17					
28SEP62	1045A	1804	5.3	23	61	51.5	2.6	25.3	22100	2440	3300	6.6		28.7	19					
29SEP62	830A	1744	5.4	22	61	50.8	2.4	22.6	23000	2455	7900	6.6		29.3	19					
	Avg.	1976	5.5	25	66	58.4	3.0	32.8	32485	3840	4608	6.7		29.0	19	17	26	39		
	Max.	2306	6.1	29	72	63.3	3.7	39.8	160000	18272	13000	6.8		29.3	22	17	32	40		
	Min.	1744	4.1	22	61	49.5	2.4	22.6	2300	280	500	6.6		28.7	17	17	20	38		
	R	562	2.0	7	10	13.8	1.3	17.2	157700	17992	12500	0.2		0.6	5	0	12	2		
	n	13	13	13	13	13	11	11	13	13	13	12		2	9	1	2	2		

TABLE A-10 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
[illegible]3 - Foot bridge upstream from paper mill discharges, Bogalusa, La.																				
13SEP62	845A	42	7.4	25	90	1.7	2.5	0.6	7900	20	330	6.4								
14SEP62	1000A	41	7.4	26	90	1.6	2.0	0.4	13000	33	7900	6.5								
17SEP62	900A	46	7.2	24	85	1.8	2.6	0.6	7900	22	1720	6.6			7	6	8	40		
18SEP62	1045A	43	7.3	27	90	1.7	2.5	0.6	17200	45	460									
19SEP62	835A	44	6.8	25	81	1.6	1.3	0.3	4600	12	700				9		19	60		
20SEP62	230P	40	8.0	26	97	1.7	1.8	0.4	7000	17	940				8					
21SEP62	150P	38	8.0	25	96	1.6	2.4	0.5	7900	18	4900				9					
22SEP62	950A	36	7.5	24	88	1.5	1.2	0.2	7900	17	1720				10					
24SEP62	1055A	36	7.8	24	92	1.5	0.3	0.1	4900	11	330				7					
25SEP62	415P	34	8.6	25	103	1.6	0.7	0.1	7000	15	490				8					
26SEP62	210P	34	8.4	25	101	1.5	0.7	0.1	7900	16	1090				8		10	29		
27SEP62	835A	32	7.5	26	91	1.3	1.6	0.3	7000	16	2300				9					
28SEP62	520P	32	8.4	23	97	1.4	1.0	0.2	4900	10	1300	6.5			6					
29SEP62	1030A	31	7.5	22	88	1.3	0.8	0.1	27400	53	1750				14					
	Avg.	38	7.7	25	92	1.6	1.5	0.3	9493	22	1852	6.5			9	6	12	43		
	Max.	46	8.6	27	103	1.8	2.6	0.6	27800	53	7900	6.6			14	6	19	60		
	Min.	31	6.8	22	81	1.3	0.3	0.1	4600	10	330	6.4			6	6	8	29		
	R	15	1.8	5	22	0.5	2.3	0.5	23200	43	7570	0.2			8	0	11	31		
	n	14	14	14	14	14	14	14	14	14	14	4			11	1	3	3		
CZW - West sewer, Crown Zellerbach Corp.																				
17SEP62	925A	17	0.0	36	0	0.0	231.7	21.3	172000	179	49000	7.4			290	15	180	2000		
18SEP62	1128A	10	0.5	38	8	0.0	226.8	12.2	1600000	976	348000									
19SEP62	950A	14	2.0	40	30	0.1	184.8	14.0	172000	148	23000				152		140	525		
20SEP62	300P	13	0.0	39	0	0.0	238.7	16.7	330000	264	20000				219				192.0	128.0
21SEP62	200P	21	3.2	36	46	0.4	149.7	16.9	700000	903	33000				108					
22SEP62	1000A	19	1.2	37	17	0.1	164.5	17.1	1300000	1508	790000				84				172.0	168.0
24SEP62	1035A	29	0.0	40	0	0.0	283.5	44.5	79000	140	22000				434				128.0	116.0
25SEP62	430P	16	2.1	40	31	0.2	154.8	13.3	130000	127	7900				108				254.0	244.0
26SEP62	225P	6	1.6	40	23	0.1	179.0	5.7	542000	201	79000				155		165	750	138.0	134.0
27SEP62	855A	12	0.7	38	11	0.0	229.0	14.9	348000	254	130000	7.4			165					
28SEP62	530P	21	0.0	38	0	0.0	229.7	25.5	2210000	2851	70000				170					
29SEP62	935A	15	1.8	35	25	0.1	169.3	15.3	1300000	1196	49000				175					
	Avg.	16	1.1	38	16	0.1	204.9	18.1	740250	729	135075	7.4			187	15	164	1091	176.8	158.0
	Max.	29	3.2	40	46	0.4	283.5	44.5	2210000	2851	790000	7.4			434	15	180	2000	254.0	244.0
	Min.	6	0.0	35	0	0.0	149.7	5.7	79000	127	7900	7.4			84	15	140	525	128.0	116.0
	R	23	3.2	5	46	0.4	133.8	38.8	2131000	2724	782100	0.0			350	0	48	1475	126.0	128.0
	n	12	12	12	12	12	12	12	12	12	12	2			11	1	3	3	5	5
CZE - East sewer, Crown Zellerbach Corp.																				
17SEP62	940A	49	0.2	37	3	0.1	183.2	48.5	94000	282	22100	7.5			190	32	213	575		
18SEP62	1130A	26	0.0	38	0	0.0	189.2	26.5	1600000	2544	240000									
19SEP62	955A	25	0.0	39	0	0.0	213.3	28.8	130000	199	22100				283		240	900		
20SEP62	305P	20	3.0	39	45	0.3	125.3	13.5	2400000	2928	120000				153				118.0	100.0
21SEP62	210P	19	2.6	36	37	0.3	172.8	17.8	23000	27	2000				258				220.0	200.0
22SEP62	1010A	19	1.0	39	15	0.1	139.7	14.4	109000	126	7000				197				174.0	156.0
24SEP62	1040A	25	0.0	39	0	0.0	185.2	25.0	330000	505	26000				227					
25SEP62	440P	26	2.2	38	33	0.3	115.5	16.2	1720000	2735	120000				127					
26SEP62	235P	24	1.7	39	25	0.2	159.3	20.7	230000	338	22000				183		240	640		
27SEP62	910A	22	1.0	36	15	0.1	154.8	18.4				7.5			175					
28SEP62	540P	25	0.1	39	1	0.0	228.3	30.8	230000	352	9000				125					
29SEP62	945A	30	1.9	36	27	0.3	131.7	21.3	790000	1454	130000				126					
	Avg.	26	1.1	38	17	0.1	166.5	23.5	696000	1045	65500	7.5			204	32	231	705	170.6	152.0
	Max.	49	3.0	39	45	0.3	228.3	48.5	2400000	2928	240000	7.5			375	32	240	900	220.0	200.0
	Min.	19	0.0	36	0	0.0	115.5	13.5	23000	27	2000	7.5			126	32	213	575	118.0	100.0
	R	30	3.0	3	45	0.3	112.8	35.0	2377000	2901	238000	0.0			249	0	27	325	102.0	100.0
	n	12	12	12	12	12	12	12	11	11	11	2			11	1	3	3	3	3

TABLE A-11 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E. COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
BL2 - Columbia St. bridge, Bogalusa, La.																				
13SEP62	905A	54	0.0	37	0	0.0	139.0	46.4	160000	528	160000	7.4								
14SEP62	1015A	53	1.6	36	23	0.5	161.2	46.1	330000	1069	80000	7.4								
17SEP62	845A	58	0.5	31	7	0.2	149.7	46.5	221000	785	33000	7.4			130	35	130	500		
18SEP62	1145A	55	0.8	33	11	0.2	160.7	47.7	2400000	8068	490000									
19SEP62	1000A	56	0.0	35	0	0.0	147.3	44.6	490000	1581	221000				183		169	360	122.0	98.0
20SEP62	315P	52	1.4	35	20	0.4	110.8	31.1	5420000	17236	1090000				121				82.0	62.0
21SEP62	230P	50	1.8	35	25	0.5	118.3	31.9	2210000	6763	790000				136				98.0	86.0
22SEP62	1025A	48	0.2	35	2	0.1	111.7	28.9	2300000	6762	790000				136				104.0	88.0
24SEP62	1105A	48	0.0	35	0	0.0	164.6	42.6	1090000	3205	110000				246				202.0	188.0
25SEP62	450P	46	0.1	34	1	0.0	130.9	32.5	2300000	6486	790000				114				82.9	65.7
26SEP62	245P	46	0.0	38	0	0.0	156.0	41.2	630000	1777	130000	7.5			193		210	1000	116.0	100.0
27SEP62	930A	44	0.0	35	0	0.0	135.2	32.2	2400000	6456	1300000				191					
28SEP62	555P	44	0.0	35	0	0.0	206.0	49.0	3480000	9361	1720000				125				122.0	110.0
29SEP62	1000A	43	0.6	35	8	0.0	125.6	29.1	2400000	6212	230000				140				110.0	97.5
	Avg.	50	0.5	35	7	0.1	146.2	39.3	1845070	5465	566714	7.4			156	35	168	620	115.4	99.5
	Max.	58	1.8	38	25	0.5	206.0	49.0	5420000	17236	1720000	7.5			246	35	210	1000	202.0	188.0
	Min.	43	0.0	31	0	0.0	110.8	28.9	160000	528	33000	7.4			114	35	130	360	82.0	62.0
	R	15	1.8	7	25	0.5	95.2	20.1	5260000	16708	1687000	0.1			132	0	80	640	120.0	126.0
	n	14	14	14	14	14	14	14	14	14	14	14			11	1	3	3	9	9
BLO - Mouth of Bogue Lusa Creek																				
13SEP62	1050A	56	1.5	30	19	0.4	41.1	12.5	4900000	16807	700000	6.9								
14SEP62	945A	54	0.0	33	0	0.0	185.8	54.3	3300000	10890	1090000	7.5								
17SEP62	305P	58	0.0	30	0	0.0	96.0	30.0	3300000	11715	700000	7.5			113	38	130	300		
18SEP62	940A	56	0.0	29	0	0.0	138.7	41.3	1300000	4459	4900000	7.6								
19SEP62	845A	56	0.0	31	0	0.0	164.8	49.6	4900000	16807	4900000	7.4			200		213	360	100.0	73.3
20SEP62	415P	52	0.0	31	0	0.0	162.3	45.7	7000000	22260	2300000	7.4			222				114.0	91.0
21SEP62	915A	50		29			111.0	30.0	4900000	14994	3300000	7.2			192				86.7	63.3
22SEP62	900A	48	0.0	27	0	0.0	111.9	29.0	3300000	9702	2300000	7.2			169				60.0	60.0
24SEP62	330P	48	0.0	32	0	0.0	166.7	43.2	3300000	9702	1090000	7.1			237				87.5	67.5
25SEP62	930A	46	0.0	30	0	0.0	134.7	33.4	4900000	13818	790000	7.3			188				77.0	54.0
26SEP62	1000A	46	0.0	30	0	0.0	154.6	35.3	3300000	9306	790000	7.8			248		200	1200	87.5	70.0
27SEP62	910A	44	0.0	30	0	0.0	93.0	22.1	3300000	8877	330000	7.2			187				136.0	100.0
28SEP62	245P	44	0.0	31	0	0.0	112.7	26.8	17200000	46268	4900000	7.0			180				76.7	63.3
29SEP62	155P	44	0.0	31	0	0.0	93.7	22.3	4900000	13181	2210000	7.2			174				73.3	70.0
	Avg.	50	0.1	30	1	0.0	126.3	34.2	4935714	14913	1849286	7.3			192	38	181	620	89.4	71.2
	Max.	58	1.5	33	19	0.4	185.8	54.3	17200000	46268	4900000	7.8			248	38	213	1200	136.0	100.0
	Min.	44	0.0	27	0	0.0	41.1	12.5	1300000	4459	330000	6.9			113	38	130	300	60.0	54.0
	R	14	1.5	6	19	0.4	144.7	41.8	15900000	41809	4570000	0.9			135	0	83	900	76.0	46.0
	n	14	14	14	13	13	14	14	14	14	14	14			11	1	3	3	10	10
COO - Mouth of Coburn Creek																				
14SEP62	1000A		0.0	27	0		78.3		170000		50000	7.0							37.0	21.0
17SEP62	330P		0.0	28	0		30.0		490000		109000	7.2			62	31	71	125		
18SEP62	930A		0.0	24	0		48.8		230000		49000	7.0								
19SEP62	900A		0.0	24	0		46.3		1300000		221000	6.9			60		70	130	49.0	29.0
20SEP62	430P		0.0	25	0		73.6		1090000		94000	7.0			81				34.0	17.0
21SEP62	905A		0.0	22	0		29.3		790000		490000	6.8			71				34.0	19.0
22SEP62	920A		0.0	23	0		47.9		490000		79000	6.9			70				29.0	16.0
24SEP62	315P		0.0	24	0		47.3		330000		49000	6.9			67				33.0	17.0
25SEP62	940A		0.0	22	0		33.1		1720000		230000	6.8			64				34.0	19.0
26SEP62	945A		0.0	23	0		36.1		790000		230000	6.8			68		73	125	35.0	20.0
27SEP62	930A		0.0	22	0		32.9		490000		79000	6.7			71					
28SEP62	230P		0.0	24	0		36.0		1300000		230000	6.6			59				48.0	24.0
29SEP62	210P		0.0	23	0		15.7		790000		130000	6.7			66				32.0	20.0
	Avg.		0.0	24	0		42.7		767692		156923	6.9			67	31	71	127	35.9	19.8
	Max.		0.0	28	0		78.3		1720000		490000	7.2			81	31	73	130	48.0	25.0
	Min.		0.0	22	0		15.7		170000		49000	6.6			59	31	70	125	29.0	16.0
	R		0.0	6	0		62.6		1550000		441000	0.6			22	0	3	5	19.0	9.0
	n		13	13	13		13		13		13	13			11	1	3	3	10	10

TABLE A-12 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
BC1 - Bogue Chitto Creek																				
11SEP62	415P	890	7.4	28	94	35.5	1.4	6.7	1090	59	90									
12SEP62	115P	872	7.4	28	94	34.8			1300	69	110	6.7								
14SEP62	335P	870	7.4	30	96	34.7	0.8	3.8	1090	58	70	6.7								
	Avg.	880	7.4	29	95	35.0	1.1	5.2	1160	62	77	6.7								
	Max.	890	7.4	30	96	35.5	1.4	6.7	1300	69	110	6.7								
	Min.	870	7.4	28	94	34.7	0.8	3.8	1090	58	50	6.7								
	R	20	0	2	2	0.8	0.6	2.9	210	11	60	0								
	n	3	3	3	3	3	2	2	3	3	3	2								
WP22 - Old U. S. 11 drawbridge over West Pearl River																				
12SEP62	105P	3370	6.7	30	88	121.7	1.7	30.9	4000	829	2000									
13SEP62	1215P	3210	6.7	29	86	115.9	1.9	32.9	1720	338	490	6.7								
14SEP62	135P	3100	6.7	30	88	112.0	1.9	31.7	1090	207	230	6.7								
17SEP62	205P	2940	7.2	30	94	114.1	2.0	31.7	3450	671	1300	6.7			16	18	27	40		
18SEP62	350P	3080	6.2	29	80	102.9	2.2	36.5	4900	924	490	6.7								
19SEP62	1035P	3200	6.4	28	81	110.4	1.8	31.0	790	155	490	6.9			19		26	38		
20SEP62	945A	3240	6.2	22	71	108.3	1.5	26.2	13000	2578	230	6.7			18					
21SEP62	855A	3110	6.7	25	80	112.3	1.4	23.5	3300	628	170	6.9			16					
22SEP62	1025A	3010	6.8	25	82	110.3	1.7	27.6	2300	424	170	6.7			16					
24SEP62	1225P	2710	7.1	25	89	103.7	1.9	27.8	3300	547	1720	6.7			16					
25SEP62	930A	2830	6.9	25	92	105.3	1.7	25.9	4900	849	270	6.9			17					
26SEP62	110P	2770	6.8	26	93	101.5	1.7	25.4	22100	3746	700	6.9			18		21	30		
27SEP62	135P	2540	7.2	25	86	98.6	2.2	30.1	7000	1098	1090	6.9			16					
28SEP62	605P	2440	7.4	24	88	97.3	2.0	26.3	4900	732	490	6.5			15					
29SEP62	810A	2370	6.7	24	78	85.6	1.9	24.3	1750	294	630	6.7		46.5	16					
	Avg.	2928	6.8	27	83	106.7	1.8	28.8	5233	928	698	6.8		46.5	17	18	25	36		
	Max.	3370	7.4	30	94	121.7	2.2	36.5	22100	3746	2000	6.9		46.5	19	18	27	40		
	Min.	2370	6.2	22	71	85.6	1.4	23.5	790	155	170	6.5		46.5	15	18	21	30		
	R	1000	1.2	8	23	36.1	0.8	13.0	21310	3591	1830	0.4		0	4	0	6	10		
	n	15	15	15	15	15	15	15	15	15	15	14		1	11	1	3	3		

TABLE A-13 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
[illegible] - U. S. 90 bridge (surface sample)																				
11SEP62	1000A		6.2	28	78		2.2		330		230	6.9								
12SEP62	800A		6.2	28	79		1.8		2300		110	6.7								
13SEP62	845P		6.8	28	87		2.4		2300		790	5.8								
17SEP62	1210P		6.7	30	87		2.2		1300		230	6.8			18	18	25	47		
18SEP62	135P		7.1	30	92		2.0		7900		80	6.9								
19SEP62	350P		6.9	29	89		1.8		4600		330	6.8			20		32	39		
20SEP62	530P		6.9	28	87		1.8		4900		230	6.7			17					
21SEP62	700P		6.9	26	84		1.4		2780		140				16					
22SEP62	815P		6.9	26	83		1.6		1300		490	6.5			16					
24SEP62	925P		7.3	26	88		1.7		4600		50	6.5			15					
25SEP62	1010P		7.0	26	85		1.8		7000		130	6.6			16					
26SEP62	1040P		6.6	25	79		2.5		940		130	6.6			16		20	41		
27SEP62	235P		7.2	26	88		2.3		3300		170	6.8			16					
28SEP62	920A		6.7	24	79		1.8		3300		170	6.9		10.5	17					
29SEP62	910A		7.0	24	83		1.8		4900		790	6.5		68.0	16					
	Avg.		6.8	27	85		1.9		3450		271	6.7		39.2	17	18	26	42		
	Max.		7.3	30	92		2.5		7900		790	6.9		68.0	20	18	32	47		
	Min.		6.2	24	78		1.4		330		50	5.8		10.5	15	18	20	39		
	R		1.1	6	14		1.1		7570		740	1.1		57.5	5	0	12	8		
	n		15	15	15		15		15		15	14		2	11	1	3	3		
[illegible] - U. S. 90 bridge (bottom sample)																				
11SEP62	1015A		6.3	28	82		1.8		4900		460	6.7								
12SEP62	745A		6.2	28	78		1.3		1300		50	6.7								
17SEP62	1145A		6.7	30	87		0.9		3300		90	6.7			17	16	27	42		
18SEP62	125P		6.7	30	89		1.2		1300		170	6.7								
19SEP62	330P		6.9	30	90		0.4		9400		790	6.8			19		33	41		
20SEP62	520P		7.0	28	88		0.6		1410		310	6.7			19					
21SEP62	700P		6.9	28	84		0.5		4900		230				16					
22SEP62	815P		6.6	26	88		0.6		4600		130	6.5			15					
24SEP62	910P		7.2	25	86		0.9		7000		110	6.6			14					
25SEP62	955P		6.9	26	83		0.6		10900		130	6.7			16					
26SEP62	1020P		6.8	25	82		0.7		2210		70	6.6			16			47		
27SEP62	225P		7.4	26	90		0.7		1300		170	7.0			16					
28SEP62	900A		6.6	24	77		0.6		3100		330	6.7		11.7	18					
29SEP62	900A		6.7	24	82		0.6		1720		330	6.7		58.7	16					
	Avg.		6.8	27	84		0.8		4096		241	6.7		35.2	17	16	30	43		
	Max.		7.4	30	90		1.8		10900		790	7.0		58.7	19	16	33	47		
	Min.		6.2	24	77		0.4		1300		50	6.5		11.7	14	16	27	41		
	R		1.2	6	13		1.4		9600		740	0.5		47.0	5	0	6	6		
	n		14	14	14		14		14		14	13		2	11	1	2	3		

TABLE A-14 - LOWER PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 000lbs/DA	B.O.D. mg/l	B.O.D. 000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
WMRT - U. S. 90 bridge (surface sample)																				
11SEP62	1035A		6.6	28	86		1.9		4900		170	6.7	4.5							
12SEP62	840A		6.0	28	78		1.8		2780		220	6.6	4.2							
13SEP62	825P		5.2	28	68		1.4		7900		330	5.4	3.5							
	Avg.		5.9	28	77		1.7		5193		240	6.2	4.1							
	Max.		6.6	28	86		1.9		7900		330	6.7	4.5							
	Min.		5.2	28	68		1.4		2780		170	5.4	3.5							
	R		1.4	0	18		0.5		5120		160	1.3	1.0							
	n		3	3	3		3		3		3	3	3							
WMRB - U. S. 90 bridge (bottom sample)																				
11SEP62	1050A		1.8	28	25		1.5		7000		230	6.9	12.6							
12SEP62	825A		0.9	29	12		1.5		50		20	6.7	11.2							
13SEP62	825P		0.8	28	12		0.6		310		20	5.6	14.1							
	Avg.		1.2	28	16		1.2		2453		90	6.4	12.6							
	Max.		1.8	29	25		1.5		7000		230	6.9	14.1							
	Min.		0.8	28	12		0.6		50		20	5.6	11.2							
	R		1.0	1	13		0.9		6950		210	1.3	2.9							
	n		3	3	3		3		3		3	3	3							
MRT - U. S. 90 bridge (surface sample)																				
11SEP62	1120A		6.9	29	91		2.0		7000		490	6.8	4.8							
12SEP62	915A		6.1	29	80		1.5		10900		330	6.7	3.8							
13SEP62	805P		5.0	29	67		1.9		17200		790	6.0	6.2							
	Avg.		6.0	29	79		1.8		11700		537	6.5	4.9							
	Max.		6.9	29	91		2.0		17200		790	6.8	6.2							
	Min.		5.0	29	67		1.5		7000		330	6.0	3.8							
	R		1.9	0	24		0.5		10200		460	0.8	2.4							
	n		3	3	3		3		3		3	3	3							
MRB - U. S. 90 bridge (bottom sample)																				
11SEP62	1105A		2.0	28	27		1.6		7900		170	6.9	13.9							
12SEP62	900A		0.6	29	8		1.6		1090		20	6.9	9.6							
13SEP62	805P		2.6	28	36		1.4		700		40	5.4	12.8							
	Avg.		1.7	28	24		1.5		3230		77	6.4	12.1							
	Max.		2.6	29	36		1.6		7900		170	6.9	13.9							
	Min.		0.6	28	8		1.4		700		20	5.4	9.6							
	R		2.0	1	28		0.2		7200		150	1.5	4.3							
	n		3	3	3		3		3		3	3	3							
EMRT - U. S. 90 bridge (top sample)																				
11SEP62	1150A		7.0	30	95		2.2		7000		490	7.0	4.8							
12SEP62	1000A		5.8	30	79		2.2		13000		230	6.7	7.9							
13SEP62	745P		5.6	29	75		2.1		24000		790	5.8	7.5							
	Avg.		6.1	30	83		2.2		14667		503	6.5	6.7							
	Max.		7.0	30	95		2.2		24000		790	7.0	7.9							
	Min.		5.6	29	75		2.1		7000		230	5.8	4.8							
	R		1.4	1	20		0.1		17000		560	1.2	3.1							
	n		3	3	3		3		3		3	3	3							
EMRB - U. S. 90 bridge (bottom sample)																				
11SEP62	1140A		4.0	30	57		3.1		1720		130	7.1	16.1							
12SEP62	940A		2.1	30	30		1.3		490		50	6.9	14.9							
13SEP62	745P		2.8	30	42		1.0		460		80	5.4	24.8							
	Avg.		3.0	30	43		1.8		890		87	6.5	18.6							
	Max.		4.0	30	57		3.1		1720		130	7.1	24.8							
	Min.		2.1	30	30		1.0		460		50	5.4	14.9							
	R		1.9	0	27		2.1		1260		80	1.7	9.9							
	n		3	3	3		3		3		3	3	3							

TABLE A-15 - EAST PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
E16 - Bridge on road to Union Baptist Church, E. of Caesar, Miss.																				
12SEP62	1050A		7.2	27	90		0.9		13000		200									
13SEP62	1105A		7.3	26	89		1.1		10900		200	6.6								
14SEP62	1215P		7.5	28	94		1.2		7000		170	6.7								
17SEP62	740A		6.8	26	82		1.0		4900		630	6.5			6	10	10	54		
18SEP62	905A		6.7	26	81		0.8					6.5								
19SEP62	910A		7.1	25	85		0.9		7900		330	6.7			8		10	29		
	Avg.		7.1	26	87		1.0		8740		306	6.6			7	10	10	42		
	Max.		7.5	28	94		1.2		13000		630	6.7			8	10	10	54		
	Min.		6.7	25	81		0.8		4900		170	6.5			6	10	10	29		
	R		0.8	3	13		0.4		8100		460	0.2			2	0	0	25		
	n		6	6	6		6		5		5	5			2	1	2	2		
E7 - Beech Road bridge, Picayune, Miss.																				
12SEP62	1020A	78	6.1	27	76	2.6	1.4	0.6	2000	10	2000									
13SEP62	1035A	82	5.8	27	72	2.6	1.4	0.6	7900	40	330	6.5								
14SEP62	1140A	78	5.7	27	71	2.4	1.5	0.6	4900	23	490	6.5								
17SEP62	705A	71	5.4	26	65	2.1	1.4	0.5	54200	236	54200	6.6			13	6	29	60		
18SEP62	830A	75	5.4	26	66	2.2	1.3	0.5	4600	21	600	6.6								
19SEP52	840A	92	5.9	26	72	2.9	1.0	0.5	2400	15	200	6.7			16		11	52		
20SEP62	1105A	80	5.8	26	69	2.5	0.9	0.4	4900	24	200	6.6			16					
21SEP62	1025A	70	6.0	24	71	2.3	0.6	0.2	2200	9	200	6.7			18					
22SEP62	835A	65	6.4	23	74	2.2	0.8	0.3	1700	7	200	6.5			16					
24SEP62	1045A	65	6.5	23	75	2.3	1.1	0.4	700	3	230	6.7			17					
25SEP62	1105A	62	5.4	24	74	2.1	1.0	0.3	790	3	170	6.5			14					
26SEP62	1115A	62	6.5	24	76	2.2	1.3	0.4	1720	7	130	6.6			16		11	44		
27SEP62	1120A	57	6.3	24	73	1.9	1.4	0.4	700	2	170	6.7		29.2	16					
27SEP62	715P	57	6.6	26	80	2.3						6.2								
28SEP62	635A	57	6.6	22	75	2.0	0.8	0.2	2780	10	310	6.5		32.5	17					
28SEP62	155P	57	6.2	25	75	1.9								16.9						
29SEP62	440P	57	6.5	23	75	2.0						6.7		41.2						
28SEP62	1150P	57	6.5	23	75	2.0						6.5		26.1						
29SEP62	620A	54		22			1.0	0.3	2210	7	170	6.6		41.6	17					
29SEP62	115P	54	7.0	22	79	2.3						6.6		12.7						
29SEP62	615P	54		24								6.5		47.0						
30SEP62	1240A	52	6.5	21	72	1.8								13.0						
30SEP62	615A	52	[illegible]	22	75	1.8	1.0	0.3	790	3	110	6.4		23.9						
30SEP62	1210P	52	6.7	22	77	1.9						6.7								
30SEP52	620P	52	7.0	22	79	2.0						6.4								
30SEP62	1155P	52	6.9	22	78	1.9						6.6		30.7						
1OCT62	635A	72	6.9	22	78	2.7	1.5	0.4	1300	6	130	6.5		21.5						
1OCT62	350P	72	6.7	23	77	2.6								13.0						
2OCT62	1215A	72	6.9	23	79	2.7						6.4		16.8						
2OCT62	615A	72	7.3	22	83	2.8	0.7	0.3	10400	48	490	6.6		17.3						
	Avg.	64	6.4	24	75	2.2	1.1	0.4	5938	26	3363	6.6		25.9	16	6	17	52		
	Max.	92	7.3	27	83	2.9	1.5	0.6	54200	236	54200	6.7		47.0	18	6	29	60		
	Min.	52	5.4	21	65	1.8	0.6	0.2	700	2	110	6.2		12.7	13	6	11	44		
	R	40	1.9	6	18	1.1	0.9	0.4	53500	234	54090	0.5		34.3	5	0	18	16		
	n	30	28	30	28	28	18	18	18	18	18	26		15	11	1	3	3		

TABLE A-16 - EAST PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 000lbs/DA	B.O.D. mg/l	B.O.D. 000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
EA - Burnt bridge W. of Picayune, Miss. on Palestine Road																				
12SEP62	1000A	78	3.6	27	45	1.5	3.4	1.6	3300	16	500									
13SEP62	1010A	82	3.2	27	40	1.4	3.5	1.3	17200	86	200	6.5								
14SEP62	1115A	78	3.7	27	46	1.6	1.8	0.8	7900	38	2300	6.5								
17SEP62	645A	71	3.2	26	40	1.2	2.6	1.0	13000	56	790	6.5				8	15	50		
18SEP62	810A	75	1.6	26	19	0.6	3.9	1.6	17200	79	10900	6.5								
19SEP62	820A	92	2.9	26	24	1.0	5.0	2.5	10900	41	330	6.5			29		10	60		
20SEP62	1150A	80	1.8	26	23	0.8	3.9	1.7	10900	53	490	6.4			30					
21SEP62	1045A	70	1.8	25	21	0.7	5.1	1.9	7000	30	490	6.5			33					
22SEP62	855A	65	1.6	24	22	0.6	5.6	2.0	3300	13	220	6.5			36					
24SEP62	1025A	65	2.2	24	26	0.8	6.0	2.1	1750	7	330	6.7			35					
25SEP62	1125A	62	2.1	24	25	0.7	4.1	1.6	3300	13	330	6.6			35					
	Avg.	74	2.5	26	30	1.0	4.1	1.6	8705	41	1530	6.5			33	8	12	55		
	Max.	92	3.7	27	46	1.6	6.0	2.5	17200	86	10900	6.7			36	8	15	60		
	Min.	62	1.6	24	19	0.6	1.8	0.8	1750	7	220	6.4			29	8	10	50		
	R	30	2.1	3	27	1.0	4.2	1.7	15450	79	10680	0.3			7	0	5	10		
	n	11	11	11	11	11	11	11	11	11	11	10			6	1	2	2		
26SEP62	1045A	62	0.1	25	1	0.0	25.8	8.6	160000	607	4900	5.7			53			75		
27SEP62	1050A	57	1.3	25	16	0.4	26.4	8.1	94200	189	4900	6.7		739	39					
27SEP62	735P	57	1.6	26	20	0.5						6.0								
28SEP62	600A	57	2.4	23	27	0.7	8.1	2.5	24000	84	700	5.6		1710	33					
28SEP62	135P	57	2.5	26	30	0.8								285						
28SEP62	420P	57	2.8	24	33	0.9						6.5		272						
28SEP62	1120P	57	2.4	24	28	0.7								151						
29SEP62	550A	54	2.3	22	26	0.7	5.2	1.5	4900	16	490	6.7		238	34					
29SEP62	1255P	54	2.5	23	29	0.7						6.5		230						
29SEP62	600P	54	3.2	24	37	0.9						5.4		516						
30SEP62	1205A	52	3.1	22	35	0.9						6.4		259						
30SEP62	550A	52	3.1	22	35	0.9	3.1	0.9	7000	22	490	6.5		316						
30SEP62	1150A	52	3.6	24	42	1.0						5.6		296						
30SEP62	600P	52	3.6	23	41	1.0						6.4		238						
30SEP62	1130P	52	3.2	22	36	0.9						5.4		368						
1OCT62	605A	72	3.0	23	35	1.2	2.8	1.1	790	3	130	6.5		395						
1OCT62	335P	72	3.2	24	38	1.2								194						
1OCT62	1150P	72	4.2	23	49	1.6						6.5		226						
2OCT62	600A	72	3.1	22	35	1.2	4.2	1.6	7900	35	3300	6.4		346						
EP32 - Log bridge at Jackson's Landing, W. of Nicholson, Miss.																				
20SEP62	1045A	138	3.4	26	42	2.5	2.4	1.8	13000	110	330	6.7			25					
21SEP62	1000A	131	4.2	24	50	3.0	2.2	2.0	10900	97	490	6.6			26					
22SEP62	925A	128	4.2	24	49	2.9	2.3	1.6	4900	38	330	6.7			26					
24SEP62	1115A	122	3.8	24	45	2.5	3.9	2.6	3300	25	220	6.6			28					
25SEP62	1035A	121	3.7	24	44	2.4	2.4	1.6	4600	34	170	6.6			28					
26SEP62	1200N	120	4.1	25	49	2.7	2.2	1.4	1300	10	90	6.6			29			48		
	Avg.	127	3.9	24	46	2.7	2.7	1.8	6333	51	272	6.6			27			48		
	Max.	138	4.2	26	50	3.0	3.9	2.6	13000	110	490	6.7			29			48		
	Min.	120	3.4	24	42	2.4	2.2	1.4	1300	10	90	6.6			25			48		
	R	18	0.8	2	8	0.6	1.7	1.2	11700	100	400	0.1			4			0		
	n	6	6	6	6	6	6	6	6	6	6	6			6			1		
27SEP62	1155A	118	0.6	24	7	0.4	27.3	17.4	160000	1155	7900	6.7		1050	39					
27SEP62	640P	118	0.7	25	9	0.4						5.1								
28SEP62	710A	118	0.1	22	1	0.1	24.7	15.7	17200	124	4900	6.5		894	37					
28SEP62	225P	118	1.3	26	15	0.8								505						
28SEP62	510P	118	2.0	24	24	1.3						6.7		470						
29SEP62	1230A	118	2.8	23	32	1.8								202						
29SEP62	650A	118	3.2	22	35	2.0	3.8	2.4	3300	24	490	6.5		772	27					
29SEP62	135P	118	4.5	23	52	2.9						5.6		119						
29SEP62	730P	118	4.6	24	54	2.9						6.4		628						
30SEP62	120A	121	4.5	22	51	2.9						6.7								
30SEP62	700A	121	4.4	22	50	2.9	2.7	1.8	330	2	130	6.[illegible]		270						
30SEP62	1240P	121	5.2	24	61	3.4						6.5								
30SEP62	655P	121	5.6	23	65	3.7						6.4		198						
1OCT62	1220A	133	5.3	22	60	3.8						6.6		266						
1OCT62	705A	133	5.0	24	58	3.6	2.5	1.8	7000	57	400	6.7								
1OCT62	435P	133	6.0	24	70	4.3								126						
2OCT62	1245A	133	5.7	23	66	4.1						6.5		285						
2OCT62	700A	133	5.2	24	61	3.7	2.0	1.4	17200	140	1090	6.6		218						

TABLE A-17 - EAST PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
EP18 - New U. S. 11 bridge over East Pearl River, S. of Nicholson, Miss.																				
12SEP62	150p	171	5.2	29	67	4.8	1.9	1.8	49000	513	8000									
13SEP62	1245p	154	4.6	25	59	3.8	2.8	2.3	49000	462	13000	6.6								
14SEP62	1255p	139	5.0	25	63	3.7	3.0	2.2	49000	417	10900	6.5								
17SEP62	305p	159	4.7	25	60	4.0	3.2	2.7	542000	5274	13000	6.6			25	10	12	54		
18SEP62	305p	152	6.0	24	76	4.9	2.2	1.8	109000	1014	3300	6.5								
19SEP62	950a	147	4.1	26	50	3.2	2.2	1.7	49000	441	7900	6.7			28		13	64		
20SEP62	1000a	141	4.0	25	48	3.0	2.8	2.1	221000	1907	49000	6.7			26					
21SEP62	915a	134	3.5	24	41	2.5	2.6	1.9	79000	648	23000	6.6			27					
22SEP62	950a	131	3.3	24	39	2.3	3.0	2.1	79000	633	79000	6.5			28					
24SEP62	1140a	124	2.8	24	33	1.9	3.1	2.1	23000	175	23000	6.5			29					
25SEP62	1010a	123	2.6	24	30	1.7	3.1	2.1	70000	527	23000	6.7			28					
26SEP62	1220p	122	3.1	26	38	2.0	3.1	2.0	130000	971	49000	[illegible]			32		20	50		
	Avg.	141	4.1	25	50	3.2	2.8	2.1	120750	1082	25175	6.6			28	10	15	56		
	Max.	171	6.0	29	76	4.9	3.1	2.7	542000	5274	79000	6.7			32	10	20	64		
	Min.	122	2.6	24	30	1.7	1.9	1.7	23000	175	3300	6.5			25	10	12	50		
	R	49	3.4	5	46	3.2	1.2	1.0	519000	5099	75700	0.2			7	0	8	14		
	n	12	12	12	12	12	12	12	12	12	12	11			8	1	3	3		
27SEP62	1225p	120	0.8	24	9	0.5	7.4	4.8	130000	955	33300	6.5		42.0	32					
27SEP62	520p	120	0.2	26	2	0.1						6.6								
28SEP62	740a	120	0.0	23	0	0.0	23.7	15.3	348000	2556	109000	6.7		91.0	48					
28SEP62	325p	120		26																
28SEP62	530p	120	0.4	24	4	0.3						6.6		36.9						
29SEP62	100a	120	0.2	24	3	0.1								73.0						
29SEP62	720a	120	0.2	22	2	0.1	15.3	9.9	542000	3980	130000			71.6	34					
29SEP62	200p	120	0.8	23	9	0.5						6.5		8.8						
29SEP62	750p	120	3.5	24	41	2.3						6.7		72.0						
30SEP62	220a	123	4.0	22	45	2.7						6.6		15.8						
30SEP62	730a	123	3.5	22	40	2.3	3.2	2.1	79000	595	49000	6.6		15.8						
30SEP62	100p	123	4.5	24	53	3.0						6.7		17.8						
30SEP62	715p	123	5.7	23	66	3.8						6.6		16.6						
1OCT62	1250a	136	6.6	24	77	4.8						6.5		21.3						
1OCT62	735a	136	5.0	23	57	3.7	2.9	2.1	46000	383	23000	6.6		19.1						
1OCT62	455p	136	5.5	24	64	4.0								18.6						
2OCT62	100a	136	5.7	24	67	4.2						6.5		22.3						
2OCT62	730a	136	4.7	23	54	3.4	2.8	2.1	141000	1174	79000	6.4		26.6						
EP22 - Old U. S. 11 bridge over East Pearl River, W. of Santa Rosa, Miss.																				
12SEP62	1245p	173	5.7	24	72	5.3	1.9	1.8	11000	116	2000									
13SEP62	1145p	156	6.1	29	77	5.1	2.4	2.0	4900	47	800	6.5								
14SEP62	115p	140	7.0	29	90	5.3	3.2	2.4	4900	42	2300	6.9								
17SEP62	233p	161	7.2	25	92	6.2	3.0	2.6	17200	169	2120	6.7			24	18	22	50		
18SEP62	330p	153	6.5	28	83	5.4	2.8	2.3	34800	326	3300	6.7								
19SEP62	101 a	148	6.0	25	75	4.8	1.9	1.5	17200	156	1410	6.6			24		16	52		
20SEP62	1020a	142	5.6	26	68	4.3	2.3	1.8	7900	69	1720	6.8			26					
21SEP62	930a	135	6.0	25	72	4.4	2.5	1.8	17200	142	3300	6.6			26					
22SEP62	1005a	132	5.8	25	69	4.1	2.6	1.8	17200	139	7900	6.9			27					
24SEP62	1200p	126	5.5	25	66	3.7	2.7	1.8	10900	84	790	6.7			25					
25SEP62	950a	125	5.8	25	70	3.9	2.5	1.7	22100	169	700	6.7			28					
26SEP62	1245p	124	4.6	25	56	3.1	2.5	1.7	22100	168	1720	6.7			29		10	46		
27SEP62	1255p	122	5.3	25	63	3.5	2.4	1.6	34800	260	2210	6.5		37.6	27					
27SEP62	600p	122	6.3	26	77	4.1						6.4								
28SEP62	800a	122	5.5	24	67	3.6	2.6	1.7	33000	246	2200	6.7		41.3	28					
	Avg.	139	5.9	26	73	4.5	2.5	1.9	18229	152	2319	6.7		39.4	26	18	16	49		
	Max.	173	7.2	29	92	6.2	3.2	2.6	34800	326	7900	6.9		41.3	29	18	22	52		
	Min.	122	4.6	24	56	3.1	1.9	1.5	4900	42	700	6.4		37.6	24	18	10	46		
	R	51	2.6	5	36	3.1	1.3	1.1	29900	284	7200	0.5		3.7	5	0	12	6		
	n	15	15	15	15	15	14	14	14	14	14	14		2	10	1	3	3		
28SEP62	545p	122	4.8	24	56	3.2						6.6		11.5						
29SEP62	130a	122	0.0	24	00	0.0								83.3						
29SEP62	750a	122	0.0	22	00	0.0	30.8	20.3	348000	2596	70000	6.6		102.9	48					
29SEP62	230p	122	0.1	23	01	0.1						6.6		97.2						
29SEP62	610p	122	0.0	24	00	0.0						6.4		88.1						
30SEP62	245a	125	1.0	22	11	0.7						6.6		63.6						
30SEP62	800a	125	0.5	23	06	0.3	12.1	8.2	79000	604	10900	6.6		67.6						
30SEP62	120p	125	0.0	24	00	0.0						6.5		66.1						
30SEP62	740p	125	0.5	22	06	0.3								23.8						
1OCT62	115a	137	2.0	24	24	1.5						6.4		33.2						
1OCT62	800a	137	4.3	24	50	3.2	3.2	2.4	22100	185	4600	6.7		23.6						
1OCT62	510p	137		24										29.2						
2OCT62	125a	137	5.9	24	69	4.4						6.6		24.1						
2OCT62	800a	137	6.7	24	78	4.9	2.2	1.6	17200	144	1300	6.6		23.3						

TABLE A-18 - EAST PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E. COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
									EP16 - Dock at Pearl River Marina, Gainesville, Miss.											
29SEP62	300P		6.9	25	82							6.6								
30SEP62	320A		4.7	23	54							6.6								
30SEP62	830A		5.0	24	58		1.7		1090		330									
30SEP62	145P		6.9	27	86							6.8								
30SEP62	805P		7.0	26	82															
1OCT62	145A		5.8	24	68							6.7								
1OCT62	830A		6.3	24	75		2.2		7900		20	6.6		166.0*						
1OCT62	530P		4.7	26	57															
2OCT62	155A		4.2	25	50							6.3								
	Avg.		5.7	25	68		2.0		4495		175	6.6		166.0*						
	Max.		7.0	27	86		2.2		7900		330	6.8		166.0						
	Min.		4.2	23	50		1.7		1090		20	6.4		166.0						
	R		2.8	4	36		0.5		6810		310	0.4		0						
	n		9	9	9		2		2		2	6		1						
2OCT62	830A		1.1	24	13		7.9		92000		54200	6.7		198.0*						
									EP8 - Stream gage, Logtown, Miss.											
29SEP62	345P		5.8	26	70							6.6								
29SEP62	845P		7.4	26	89							6.4								
30SEP62	355A		6.8	24	80							6.6								
30SEP62	900A		7.3	26	89		1.2		1730		130	6.6								
30SEP62	215P		8.2	28	103							6.8								
30SEP62	830P		9.3	25	111															
1OCT62	210A		7.6	24	89							6.7								
1OCT62	900A		7.2	26	87		1.1		7900		230	6.8								
1OCT62	555P		6.0	26	73															
2OCT62	225A		6.7	25	80							6.8		723.0*						
2OCT62	905A		6.4	26	78		1.4		13000		460	6.6		854.0*						
	Avg.		7.2	26	86		1.2		7550		273	6.6		788.5*						
	Max.		9.3	28	111		1.4		13000		460	6.8		854.0						
	Min.		5.8	24	70		1.1		1750		130	6.4		723.0						
	R		3.5	4	41		3		11250		330	0.4		131.0						
	n		11	11	11		3		3		3	9		2						

* Chloride Interference

TABLE A-19 - EAST PEARL RIVER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
EP5T - U. S. 90 bridge over East Pearl River (surface sample)																				
11SEP62	110P		7.5	29	99		2.8		3300		220	7.0	3.5							
12SEP62	1040A		6.0	29	91		1.9		2300		130	6.7	7.9							
13SEP62	715P		6.6	29	90		1.6		1720		170		8.9							
17SEP62	1250P		6.6	30	90		1.6		2300		50	6.7	7.2		28	9500	11	25		
18SEP62	210P		6.8	30	92		1.8		2210		80	6.9	4.8							
19SEP62	425P		6.6	29	90		1.3		17200		1090	6.9	9.2		36		10	24		
20SEP62	605P		5.9	28	78		1.4		4900		230	6.8	7.2		34					
21SEP62	640P		6.3	26	81		2.0		3300		130		9.8		38					
22SEP62	755P		5.1	26	66		1.2		2120		130	6.6	10.8		42					
24SEP62	1005P		6.2	26	81		1.3		7000		170	6.7	11.6		36					
25SEP62	1050P		4.9	26	64		1.3		2300		330	6.7	13.3		39					
26SEP62	1200M		4.5	26	58		1.0		4900		330	6.6	10.8		34					
27SEP62	310P		7.3	26	93		1.8		1300		50	6.8	9.8		30		10	24		
27SEP62	630P		7.3	27	93							6.4								
28SEP62	1005A		6.6	24	78		1.4		1720		170	6.8	8.2	96.7	34					
28SEP62	650P		7.4	26	90							6.6		96.7						
29SEP62	200A		7.4	24	88															
29SEP62	950A		7.4	25	88		1.3		230		20	6.9	8.2		26					
29SEP62	400P		8.6	25	102							7.0								
29SEP62	930P		8.3	26	101							6.5								
30SEP62	420A		7.6	24	89							6.8								
30SEP62	930A		5.4	27	67		1.6		4900		40	6.8								
30SEP62	245P		8.4	28	106							6.9								
30SEP62	850P		8.0	25	95															
1OCT62	230A		8.3	26	101							7.1								
1OCT62	930A		8.1	26	99		1.6		3300		700	6.9		802.0*						
1OCT62	610P		2.2	28	28															
2OCT62	250A		7.4	26	90							6.5		777.0*						
2OCT62	930A		5.0	26	61		1.7		7900		1300	6.8								
	Avg.		6.7	27	84		1.6		4050		297	6.8	8.7	443.1	34	9500	10	24		
	Max.		8.6	30	106		2.8		17200		1090	7.1	13.3	802.0	42	9500	11	25		
	Min.		2.2	24	28		1.0		230		20	6.4	3.5	96.7	26	9500	10	24		
	R		6.4	6	78		1.8		16970		1070	0.7	9.8	705.3	16	0	1	1		
	n		29	29	29		18		18		18	24	15	4	11	1	3	3		
EP5B - U. S. 90 bridge over East Pearl River (bottom sample)																				
11SEP62	1250P		2.6	29	38		1.4		790		80	7.0	18.3							
12SEP62	1025A		1.7	30	24		1.0		80		20	6.9	14.5							
13SEP62	715P		1.8	29	25		0.8		220		20	5.8	14.1							
17SEP62	1235P		2.0	30	29		0.3		80		20	7.0	16.6		52	2540	10	11		
18SEP62	150P		1.9	30	27		0.2		50		20	6.9	12.8							
19SEP62	410P		1.8	30	23		0.2		80		20	6.9	15.8		59		12	13		
20SEP62	550P		2.7	28	38		0.6		230		50	7.1	15.2		57					
21SEP62	620P		4.5	28	62		0.4		220		50		15.2		57					
22SEP62	735P		3.4	26	45		0.7		790		40	6.5	14.9		52					
24SEP62	950P		4.0	26	54		1.8		330		20	6.6	17.0		50					
25SEP62	1035P		4.7	26	63		0.6		460		50	6.8	15.7		50					
26SEP62	1120P		4.0	25	53		1.5		140		50	7.0	18.6		58		70	23		
27SEP62	255P		3.5	26	47		0.6		460		50	7.0	16.5		56					
28SEP62	950A		3.0	26	40		0.6		490		20	7.0	17.5		58					
29SEP62	935A		2.3	26	31		0.5		630		50	6.9	18.2		56					
	Avg.		2.9	28	40		0.7		337		37	6.8	16.1		55	2540	31	16		
	Max.		4.7	30	63		1.8		790		80	7.1	18.6		59	2540	70	23		
	Min.		1.7	25	23		0.2		50		20	5.8	12.8		50	2540	10	11		
	R		3.0	5	40		1.6		740		60	1.3	5.8		9	0	60	12		
	n		15	15	15		15		15		15	14	15		11	1	3	3		

* Chloride Interference

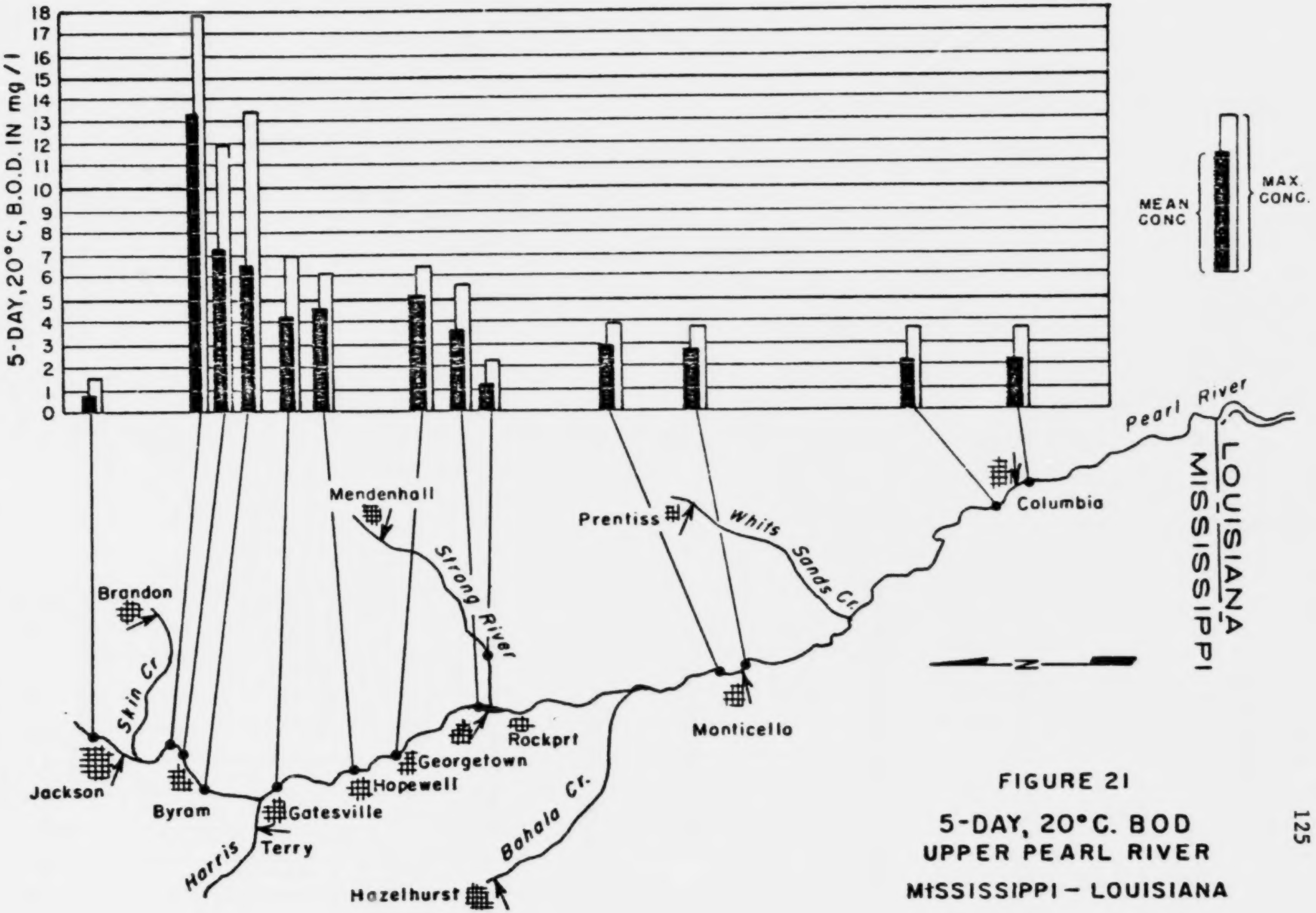

FIGURE 21

5-DAY, 20°C. BOD
UPPER PEARL RIVER
MISSISSIPPI – LOUISIANA

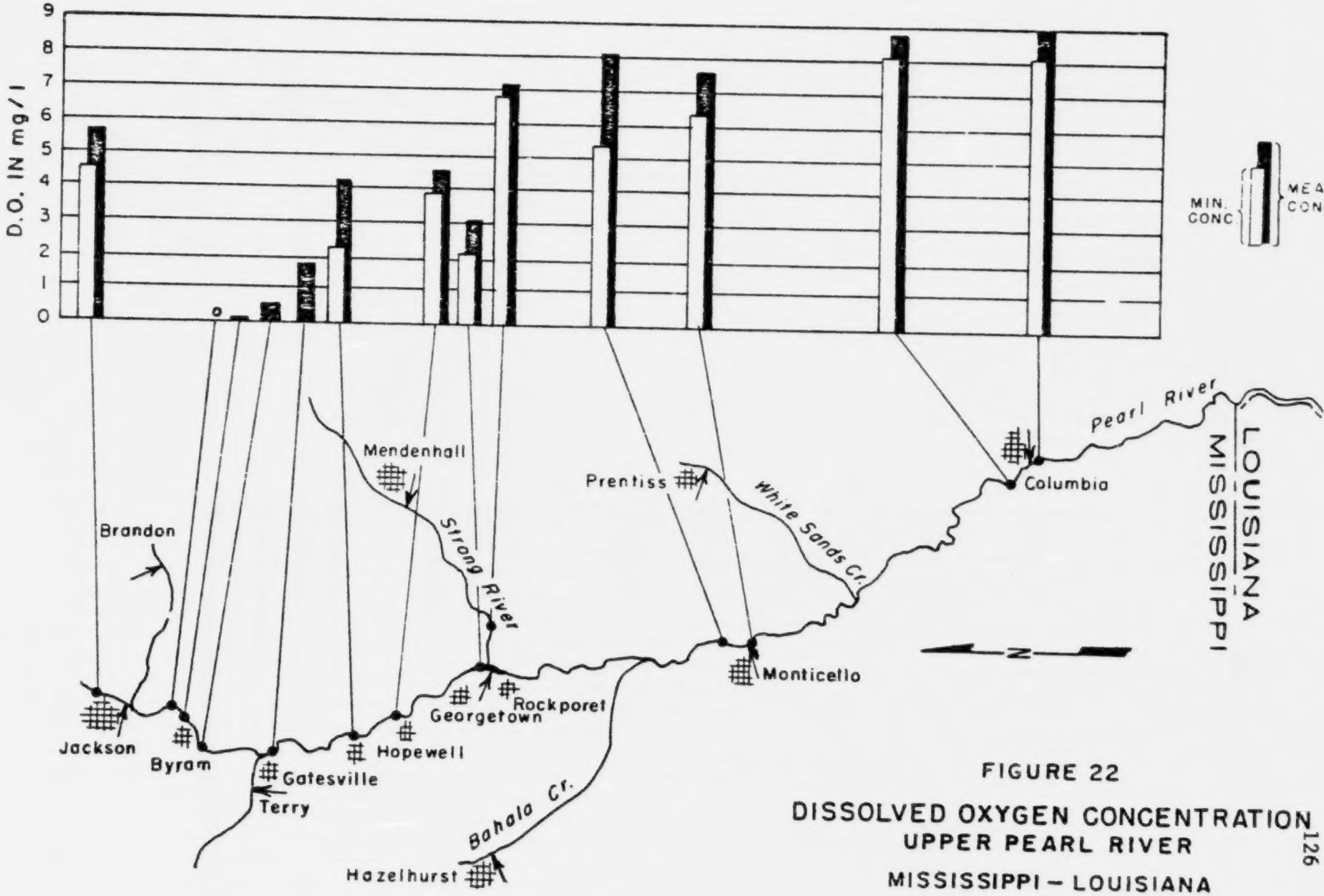

FIGURE 22

DISSOLVED OXYGEN CONCENTRATION
UPPER PEARL RIVER
MISSISSIPPI – LOUISIANA

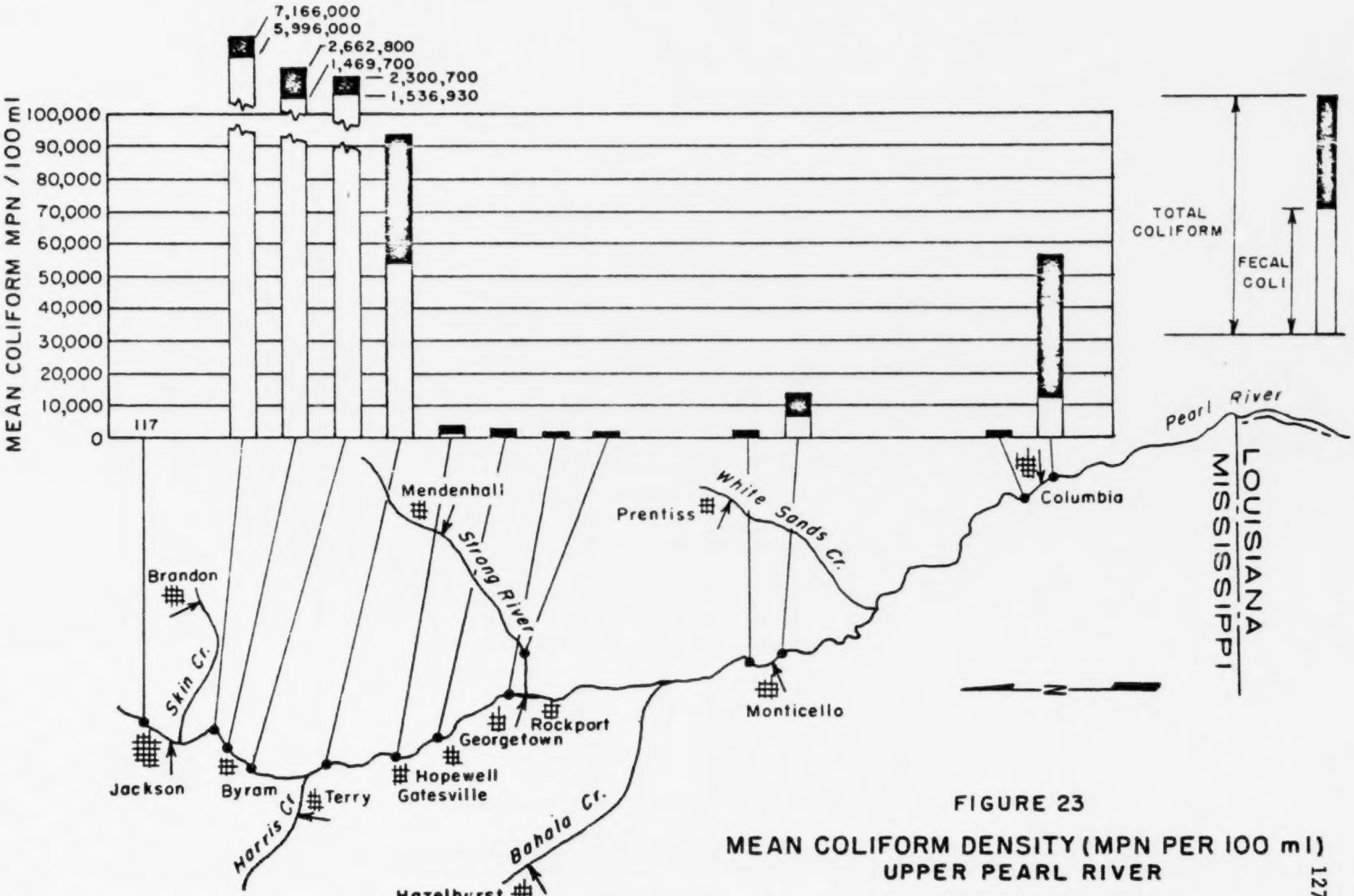

FIGURE 23

MEAN COLIFORM DENSITY (MPN PER 100 ml)
UPPER PEARL RIVER
MISSISSIPPI – LOUISIANA

TABLE A-21 - SALT WATER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
EPOT - Confluence of Old Pearl and East Pearl Rivers (surface sample)																				
18SEP62	125P			32					1100		110	7.2	9.0							
20SEP62	112P			30					490		79	7.2	12.6							
24SEP62	115P			27					17		8	7.2	20.3							
26SEP62	1025A			28					1100		130	7.1	11.9							
28SEP62	1015A			27					330		130	7.4	6.9							
	Avg.			29					607		91	7.2	12.1							
	Max.			32					1100		130	7.4	20.3							
	Min.			27					17		8	7.1	6.9							
	R			5					1083		122	0.3	13.4							
	n			5					5		5	5	5							
EPOB - Confluence of Old Pearl and East Pearl Rivers (bottom sample)																				
18SEP62	125P											7.0	18.6							
20SEP62	112P			30					110		23	7.5	18.0							
24SEP62	115P			27					27		7	7.4	20.4							
26SEP62	1025A			28					140		33	7.0	19.6							
28SEP62	1015A			27					310		17	7.3	12.7							
	Avg.			28					147		20	7.2	17.9							
	Max.			30					310		33	7.5	20.4							
	Min.			27					27		7	7.0	12.7							
	R			3					283		26	0.5	7.7							
	n			4					4		4	5	5							
LLAT - Mouth of Little Lake Pass (surface sample)																				
18SEP62	118P			31					110		23	7.2	12.7							
20SEP62	105P			30					490		130	7.6	13.6							
24SEP62	100P			27					4		4	7.2	21.1							
26SEP62	1020A			28					23		23	7.1	14.1							
28SEP62	1010A			27					490		31	7.5	7.3							
	Avg.			29					223		42	7.3	13.8							
	Max.			31					490		130	7.6	21.1							
	Min.			27					4		4	7.1	7.3							
	R			4					486		126	0.5	13.8							
	n			5					5		5	5	5							
LLAB - Mouth of Little Lake Pass (bottom sample)																				
18SEP62	118P			31								7.0	16.5							
20SEP62	105P			30					130		17	7.2	19.2							
24SEP62	100P			27					17		4	7.3	21.4							
26SEP62	1020A			28					280		49	7.2	19.3							
28SEP62	1010A			27					33		13	7.2	18.9							
	Avg.			29					115		21	7.2	19.1							
	Max.			31					280		49	7.3	21.4							
	Min.			27					17		4	7.0	16.5							
	R			4					263		45	0.3	4.9							
	n			5					4		4	5	5							

TABLE A-22 - SALT WATER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
LB5T - Confluence of East Pearl and Lake Borgne (surface sample)																				
18SEP62	105P			31					130		23	7.3	16.5							
20SEP62	1250P			30					110		110	7.5	20.3							
24SEP62	1240P			27					2		2	7.4	22.6							
26SEP62	1005A			28					230		130	7.4	19.4							
28SEP62	955A			27					49		23	7.4	13.5							
	Avg.			29					104		58	7.4	18.5							
	Max.			31					230		130	7.5	22.6							
	Min.			27					2		2	7.3	13.5							
	R			4					228		128	0.2	9.1							
	n			5					5		5	5	5							
LB5B - Confluence of East Pearl and Lake Borgne (bottom sample)																				
18SEP62	105P											7.0	18.4							
20SEP62	1250P			29					95		17	7.7	19.9							
24SEP62	1240P			27					2		2	7.5	22.7							
26SEP62	1005A			28					37		8	7.8	22.4							
28SEP62	955A			27					93		23	7.5	17.5							
	Avg.			28					57		12	7.5	20.2							
	Max.			29					95		23	7.8	22.7							
	Min.			27					2		2	7.0	17.5							
	R			2					93		21	0.8	5.2							
	n			4					4		4	5	5							
LB6T - Near Pearl River Light (surface sample)																				
18SEP62	1258P			31					4		2	7.5	19.7							
20SEP62	1243P			30					2		2	7.8	21.5							
24SEP62	1235P			27					2		2	7.7	22.9							
26SEP62	956A			29					140		46	7.8	21.0							
28SEP62	947A			26					46		17	7.5	16.1							
	Avg.			28					39		14	7.7	20.2							
	Max.			31					140		46	7.8	22.9							
	Min.			26					2		2	7.5	16.1							
	R			5					138		44	0.3	6.8							
	n			5					5		5	5	5							
LB6B - Near Pearl River Light (bottom sample)																				
18SEP62	1258P			31								7.7	20.3							
20SEP62	1243P			30								7.5	21.0							
24SEP62	1235P			27								7.6	22.8							
26SEP62	956A			28								7.9	22.7							
28SEP62	947A			26								7.8	16.9							
	Avg.			28								7.7	20.7							
	Max.			31								7.9	22.8							
	Min.			26								7.5	16.9							
	R			5								0.4	5.9							
	n			5								5	5							

TABLE A-23 - SALT WATER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000lbs/DA	B.O.D. mg/l	B.O.D. 1000lbs/DA	COLIFORM MPN/100ml	B.P.E.	E.COLI MPN/100ml	pH	SALINITY P.P.T.	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S mg/l
HBST - Heron Bay (surface sample)																				
18SEP62	1244P			31					27		2	7.8	19.0							
20SEP62	1232P			30					2		2	7.6	20.5							
24SEP62	1222P			27					7		4	7.6	22.1							
26SEP62	942A			28					4		2	7.7	22.8							
28SEP62	935A			25					2		2	7.8	20.6							
	Avg.			28					9		2	7.7	21.0							
	Max.			31					27		4	7.8	22.8							
	Min.			25					2		2	7.6	19.0							
	R			6					25		2	0.2	3.8							
	n			5					5		5	5	5							
GIST - Grand Island Pass, Grassy Is. (surface sample)																				
18SEP62	1238P			31					2		2	7.6	19.5							
20SEP62	1225P			30					2		2	7.7	22.0							
24SEP62	1215P			27					2		2	7.7	22.7							
26SEP62	935A			27					23		2	8.0	23.1							
28SEP62	930A			27					4		2	7.8	17.6							
	Avg.			28					7		2	7.8	21.0							
	Max.			31					23		2	8.0	23.1							
	Min.			27					2		2	7.6	17.6							
	R			4					21		0	0.4	5.5							
	n			5					5		5	5	5							
GISB - Grand Island Pass, Grassy Is. (bottom sample)																				
18SEP62	1238P			31								7.6	20.0							
20SEP62	1225P			29								7.7	22.1							
24SEP62	1215P			27								7.7	23.0							
26SEP62	935A			27								8.0	23.1							
28SEP62	930A			27								7.8	19.0							
	Avg.			28								7.8	21.4							
	Max.			31								8.0	23.1							
	Min.			27								7.6	19.0							
	R			4								0.4	4.1							
	n			5								5	5							

TABLE A-24 - SALT WATER

DATE	TIME	FLOW C.F.S.	D.O. mg/l	TEMP. °C	% SAT	D.O. 1000 lbs/DA	B.O.D. mg/l	B.O.D. 1000 lbs/DA	COLIFORM MPN/100ml	B.P.E.	E. COLI MPN/100ml	pH	SALINITY P.P.T	C.O.D. mg/l	T. ALK. mg/l	HARDNESS mg/l	TURBID	COLOR	T.S.S. mg/l	V.S. mg/l
S9T - St. Joseph Pt. (surface sample)																				
18SEP62	1223P			31					4		2	7.6	20.3							
20SEP62	1213P			29					2		2	7.7	22.4							
24SEP62	1200M			27					2		2	7.7	23.9							
26SEP62	922A			27					2		2	8.0	23.7							
28SEP62	917A			27					2		2	8.0	19.7							
	Avg.			28					2		2	7.8	22.0							
	Max.			31					4		2	8.0	23.9							
	Min.			27					2		2	7.6	19.7							
	R			4					2		0	0.4	4.2							
	n			5					5		5	5	5							
S9B - St. Joseph Pt. (bottom sample)																				
18SEP62	1223P			31								7.5	21.0							
20SEP62	1213P			29								7.7	22.8							
24SEP62	1200M			27								7.8	24.0							
26SEP62	922A			27								8.0	23.7							
28SEP62	917A			27								7.9	20.5							
	Avg.			28								7.8	22.4							
	Max.			31								8.0	24.0							
	Min.			27								7.5	20.5							
	R			4								0.5	3.5							
	n			5								5	5							
S10T - Off Bayou Caddy (surface sample)																				
18SEP62	1207P			31					4		2	7.8	22.4							
20SEP62	1200M			29					2		2	7.8	23.7							
24SEP62	1145A			27					2		2	7.8	24.9							
26SEP62	910A			27					2		2	8.0	24.5							
28SEP62	905A			26					2		2	7.9	23.0							
	Avg.			28					2		2	7.9	23.7							
	Max.			31					4		2	8.0	24.9							
	Min.			26					2		2	7.8	22.4							
	R			5					0		0	0.2	2.5							
	n			5					5		5	5	5							
S10B - Off Bayou Caddy (bottom sample)																				
18SEP62	1207P			31								7.7	22.4							
20SEP62	1200M			29								7.6	23.9							
24SEP62	1145A			27								7.8	25.0							
26SEP62	910A			27								8.0	24.4							
28SEP62	905A			26								7.9	23.8							
	Avg.			28								7.8	23.9							
	Max.			31								8.0	25.0							
	Min.			26								7.6	22.4							
	R			5								0.4	2.6							
	n			5								5	5							

OTHER DATA

Long-Term B.O.D.

Three different samples were collected at both P-71 and P-42 for long-term B.O.D.'s. These data are shown in Table A25, along with the ultimate B.O.D. and the reaction constants K_1 to the base *e*, which were calculated on the analog computer.

Sewer Analyses, Crown Zellerbach Corp.

Twenty-four composite samples were collected from the two sewers at the Bogalusa Division by Crown Zellerbach and analyzed by them. These data are tabulated in Table A26.

TABLE A-25

Long-Term B.O.D.
Pearl River - 1962

Date	Time	B.O.D.	Date	Time	B.O.D.	Date	Time	B.O.D.
P-71								
9/15	12:30p	0	9/18	5:45p	0	9/20	10:00p	0
9/16	9:00a	1.58	9/18	11:00p	0.36	9/21	10:00a	1.17
9/17	12:30p	3.14	9/19	5:15p	1.37	9/21	10:00p	1.75
9/18	12:00p	4.23	9/20	5:15p	2.90	9/22	10:00p	3.15
9/19	11:00a	4.90	9/21	5:00p	4.22	9/23	9:15p	4.30
9/20	11:00a	5.55	9/22	5:00p	4.72	9/24	10:15p	5.00
9/20	10:00p	5.75	9/23	5:00p	5.41	9/25	9:30p	5.57
9/21	12:00p	6.03	9/24	5:10p	5.92	9/26	10:30p	6.06
9/22	11:00a	6.33	9/25	5:15p	6.37	9/27	10:00p	6.26
9/23	12:00n	6.78	9/26	5:15p	6.82	9/28	9:30p	6.64
9/24	12:00n	7.36	9/27	5:00p	7.28	9/29	8:30p	7.23
9/25	12:30p	7.51	9/28	5:00p	7.82	9/30	10:00p	7.52
9/26	11:30a	7.67	9/29	5:00p	7.97	10/1	9:00a	7.49
9/27	11:30a	7.85	9/30	4:00p	8.13	10/2	9:00p	7.82
			10/1	4:15p	8.35	10/3	9:00p	7.74
Ult. B.O.D. = 8.5 mg/l			10/2	4:15p	8.47	10/4	8:15p	7.92
K_1 = 0.21			10/3	4:30p	8.57	10/5	9:15p	8.28
			10/4	4:00p	8.95			
			10/5	4:00p	9.02	Ult. B.O.D. = 8.5 mg/l		
						K_1 = 0.21		
			Ult. B.O.D. = 9.1 mg/l					
			K_1 = 0.21					
P-42								
9/15	5:00p	0	9/18	6:15p	0	9/20	12:30p	0
9/16	9:00a	0.68	9/18	11:00p	0.25	9/21	12:00n	0.85
9/17	5:00p	1.50	9/19	5:15p	0.79	9/22	11:00a	1.32
9/18	4:00p	1.98	9/20	5:15p	1.41	9/23	12:00p	1.87
9/19	5:15p	2.61	9/21	5:00p	2.20	9/24	12:00n	2.25
9/20	5:15p	3.08	9/22	5:00p	2.66	9/25	12:30p	2.71
9/21	5:00p	3.38	9/23	5:00p	3.11	9/26	11:30a	2.99
9/22	5:00p	3.68	9/24	5:10p	3.41	9/27	11:30a	3.32
9/23	5:00p	4.18	9/25	5:15p	3.86	9/28	2:00p	3.50
9/24	5:10p	4.38	9/26	5:15p	4.21	9/29	12:00p	3.68
9/25	5:15p	4.64	9/27	5:00p	4;45	9/30	1:30p	4.05
9/26	5:15p	5.03	9/28	5:00p	4.60	10/1	12:15p	4.12
9/27	5:00p	4.98	9/29	5:00p	4.81	10/2	12:00p	4.25
9/28	5:00p	5.20	9/30	4:00p	4.83	10/3	11:30a	4.65
9/29	5:00p	5.48	10/1	4:15p	5.19	10/4	11:15a	4.51
			10/2	4:15p	5.29	10/5	12:30p	4.92
Ult. B.O.D. = 6.4 mg/l			10/3	4:30p	5.31	10/6	11:30a	4.95
K_1 = 0.15			10/4	4:00p	5.61			
			Ult. B.O.D. = 6.1 mg/l			Ult. B.O.D. = 5.5 mg/l		
			K_1 = 0.15			K_1 = 0.14		

TABLE A-26

Sewer Analyses for September 10 through September 30, 1962

Bogalusa Division of Crown Zellerbach

Date	Sewer Flow in MGD			BOD, lbs./Day			Pulp Losses, lb./Day		
	East Sewer	West Sewer	Total	East Sewer	West Sewer	Total	East Sewer	West Sewer	Total
Sept. 10, 1962	17.95	11.14	29.09	37,000	28,100	65,100	-28,000	- 7,860	-35,860
11	16.28	11.47	27.75	34,600	26,700	61,300	-40,000	-18,100	-58,100
12	16.66	10.92	27.58	37,800	26,000	63,800	-28,300	-18,100	-46,400
13	14.29	11.19	25.48	30,800	36,400	67,200	-62,500	-12,450	-74,950
14	15.41	11.84	27.25	32,500	24,300	56,800	-51,800	-30,800	-82,600
15	14.50	10.74	25.24	36,800	35,600	72,400	-22,850	- 6,920	-29,770
16	13.18	11.34	24.52	30,500	28,200	58,700	-21,400	-18,600	-40,000
17	12.56	8.95	21.51	28,000	30,900	58,900	-35,800	- 4,950	-40,750
18	14.96	8.83	23.79	43,700	22,600	66,300	-37,800	- 0	-37,800
19	16.74	8.40	25.14	33,500	20,500	54,000	-38,500	- 7,550	-46,050
20	13.40	11.18	24.58	28,800	23,000	51,800	-33,800	- 8,680	-42,480
21	12.93	13.06	25.99	20,500	26,900	47,400	-32,900	-18,150	-51,050
22	13.04	12.31	25.35	29,300	23,000	53,100	-21,400	-19,150	-40,550
23	19.61	4.92	24.53	36,200	6,450	42,650	-35,900	0	-35,900
24	14.96	10.54	25.50	-	-	-	-30,000	-11,850	-41,850
25	14.54	9.58	24.12	26,800	21,300	48,100	-46,500	- 9,400	-55,900
26	15.54	10.12	25.66	18,100	25,800	43,900	-27,300	- 4,200	-31,500
27	15.90	10.96	26.86	17,600	18,400	36,000	-35,600	-11,100	-46,700
28	14.93	13.37	28.30	21,300	28,200	49,500	-16,700	-17,400	-34,100
29	19.46	5.36	24.82	31,300	5,350	36,650	-28,900	0	-28,900
30	22.78	5.75	28.53	17,000	9,300	26,300	-44,800	0	-44,800

APPENDIX B

BIOLOGICAL DATA

APPENDIX B

BIOLOGICAL DATA

BASIC BIOLOGICAL PRINCIPLES

In natural habitats, there exists a wide variety of bottom organisms; each occupies a niche in the community where the characteristics of the individual are most efficiently utilized in the normal life processes. Each form of organism is limited in numbers by food supply, competition, predation, and the aquatic phase of its life cycle. In clean water habitats the interplay of the many forms of organisms allows no one form to dominate the community.

Most benthic forms also are limited to the type of environment they may occupy by physiological and morphological factors characteristic of the species. When an abnormal factor (for example, organic pollution) is added to the environment, those organisms not able to adjust to the environmental change succumb. Removal of the sensitive forms open up new niches for those organisms that remain, and if the pollutant can be utilized as food, the surviving organisms rapidly increase their numbers to occupy available space. This situation is best illustrated in the formation and organism population of sludge beds. Sensitive benthic forms (for example, immature mayflies and caddisflies) are driven out of their natural habitat as a result of the reduction in dissolved oxygen and/or smothering of the natural diverse substrate by the organic solids. Tolerant forms (sludgeworms and bloodworms) multiply rapidly in numbers by utilizing the organics in sludge as food. Thus, a natural stream bottom with a diverse substrate will support many different kinds of organisms with few individuals representing each kind; whereas, a sludge bed supports a tremendous population of organisms composed of two or three different kinds of individuals.

When toxic wastes, thermal pollutants or inorganic sediments are involved, tolerant forms show little if any increase in numbers. Severe conditions may make the environment adverse for even these, thus very few or even no organisms may survive in some reaches of a stream receiving such materials.

METHODS OF SURVEY

Two methods of collecting were used in this survey - qualitative and quantitative. Qualitative samples collect representative types of organisms living at a given station. Quantitative samples show population abundance and were taken with an Ekman dredge which collects 1/4 square foot of the bottom material. These samples were washed on a U. S. Standard #30 sieve and the remaining debris and organisms preserved. The organisms were removed from the sample in the laboratory, identified, enumerated and tabulated as number per square foot of bottom.

TABLE B-1

Species[1] of Bottom Dwelling Animals - Pearl River
September, 1962

	River Mile								
	P-77.3	P-74.3*	P-71.0	P-63.6	P-63.1	P-56.6	P-50.3	P-46.3	P-42.0
Stonefly Naiad	1	1	-	-	-	-	-	1	1
Mayfly Naiad	5	2	-	-	-	1	-	2	4
Caddisfly Larvae	1	3	-	-	-	-	-	2	3
Hellgrammite	1	1	-	-	-	1	1	-	1
Clam (Unionid)	2	2	-	-	-	1	-	2	1
Fingernail Clam	1	-	-	1	-	1	1	1	-
Snail (Operculate)	1	-	-	1	1	1	-	1	-
Snail (Pulmonate)	-	-	1	1	1	1	2	3	1
Sowbug	-	-	-	-	-	-	-	1	-
Scud	-	-	-	-	-	-	-	1	-
Aquatic Moth Larvae	-	-	-	-	-	-	-	1	-
Crane Fly Larvae	-	-	-	-	-	-	-	1	-
Horse Fly Larvae	-	-	1	-	1	-	-	-	-
Biting Midge Larvae	1	1	-	1	-	-	-	1	1
Midge Larvae (Bloodworm)	4	-	1	1	2	3	3	5	2
Beetle Larvae (Elmidae)	2	1	-	1	-	1	1	2	2
Giant Water Bug	-	-	-	-	-	-	1	-	-
Damselfly Naiad	1	-	1	1	-	-	2	1	-
Dragonfly Naiad	1	1	1	1	1	1	1	3	1
Leech	-	1	1	3	1	1	1	-	-
Sludgeworm	P	P	P	P	P	P	P	P	P
Total Kinds	22	14	7	12	9	13	14	29	18

* - Mississippi Shore - The Louisiana Shore supported only 2 kinds of bloodworms

P - Present - Various kinds of sludgeworms were not determined

1 - Tentative identifications

TABLE B-2

Mean Number of Organisms[1]
Per Square Foot of Bottom, Pearl River
September, 1962

	River Mile								
	P-77.3	P-74.3	P-71.0	P-63.6	P-63.1	P-56.6	P-50.3	P-46.3	P-42.0
Stonefly Naiad	-	-	-	-	-	-	-	4	-
Mayfly Naiad	7	-	-	-	-	-	-	1	-
Caddisfly Larvae	1	-	-	-	-	-	-	1	-
Clams (Unionid)	1	-	-	-	-	1	-	-	3
Fingernail Clams	1	-	-	1	-	-	-	-	-
Snail (Operculate)	1	-	-	-	1	-	-	-	1
Beetle Larvae (Elmidae)	-	-	-	1	-	-	-	-	7
Cranefly Larvae	-	-	-	-	-	-	-	1	-
Biting Midge Larvae	-	-	5	-	-	-	-	1	1
Midge Larvae (Bloodworm)	13	1	3	-	51	5	-	13	8
Dragonfly Naiad	-	1	-	1	-	-	-	-	-
Sludgeworm	171	152	2126	936	789	120	264	47	13
Leech	-	-	3	4	-	4	-	-	-
Total per sq. ft.	195	154	2137	943	841	130	264	68	33

---

[1] - Tentative identifications

TABLE B-3

Mean Number of Organisms[1]
Per Square Foot of Bottom, East Pearl River
September, 1962

	River Mile							
	WH-6.0	H-15.7	H-9.7	H-3.9	EP-32.1	EP-28.4	EP-21.8	Farr's Slough
Mayfly Naiad	19	3	-	-	-	3	1	-
Caddisfly Larvae	3	1	-	-	3	3	1	-
Clams (Unionid)	-	-	-	-	-	-	-	1
Fingernail Clams	-	-	-	-	-	1	1	-
Beetle Larvae (Elmidae)	-	4	-	1	-	1	1	-
Crane Fly Larvae	4	1	-	-	-	-	-	-
Midge Larvae (Bloodworm)	49	19	5	103	23	195	7	16
Biting Midge	12	-	-	-	-	16	1	-
Horse Fly Larvae	-	3	-	-	-	-	-	-
Dragonfly Naiad	1	-	1	-	1	1	1	-
Leech	-	-	-	-	4	-	-	1
Sludgeworm	3	11	13	181	19	52	13	29
Total Number	91	42	19	285	50	272	26	47

---

1 - Tentative identifications

TABLE B-4

Species[1] of Bottom Dwelling Animals - East Pearl River
Before Fish-Kill

	River Mile							
	WH- 6.0	H- 15.7.	H- 9.7	H- 3.9	EP- 32.1	EP- 28.4	EP- 21.8	Farr's Slough
Stonefly Naiad	2	1	-	-	1	1	1	1
Mayfly Naiad	10	3	3	-	2	1	2	6
Caddisfly Larvae	6	3	2	-	3	4	1	4
Hellgrammite	1	1	-	-	1	1	1	1
Clam (Unionid)	1	-	-	-	-	-	-	1
Fingernail Clam	-	-	-	-	-	-	1	1
Snail (Pulmonate)	2	-	1	-	2	1	2	1
Sowbug	-	-	-	-	-	-	1	-
Scud	-	-	-	-	1	-	-	-
Crayfish	-	-	-	-	1	-	-	-
Crane Fly Larvae	1	-	1	-	-	-	-	-
Snipe Fly Larvae	-	1	-	-	-	-	-	-
Black Fly Larvae	1	-	-	-	-	-	-	-
Horse Fly Larvae	-	-	-	-	-	-	1	-
Biting Midge Larvae	1	-	-	-	-	1	1	-
Midge Larvae (Bloodworm)	3	4	2	3	2	7	4	2
Beetle Larvae	5	3	1	-	3	3	3	1
Damselfly Naiad	2	1	1	-	3	2	3	-
Dragonfly Naiad	4	1	-	-	2	3	1	1
Leech	1	-	-	-	1	1	2	-
Sludgeworm	P	P	P	P	P	P	P	P
Total Kinds	41	19	12	4	23	26	25	20

P - Present - Various kinds of sludgeworms not determined

[1] - Tentative identification

TABLE B-4, CONTINUED

After Fish-Kill

	River Mile			
	H- 3.9	EP- 32.1	EP- 28.4	EP- 21.8
Stonefly Naiad	-	-	-	-
Mayfly Naiad	-	-	-	-
Caddisfly Larvae	-	-	-	-
Hellgrammite	-	-	-	-
Clam (Unionid)	-	-	-	-
Fingernail Clam	-	-	-	-
Snail (Pulmonate)	-	1	1	1
Sowbug	-	-	-	-
Scud	-	-	-	-
Crayfish	-	-	-	-
Crane Fly Larvae	-	-	-	-
Snipe Fly Larvae	-	-	-	-
Black Fly Larvae	-	-	-	-
Horse Fly Larvae	-	-	-	-
Biting Midge Larvae	-	-	-	-
Midge Larvae (Bloodworm)	-	2	-	-
Beetle Larvae	-	3	2	-
Damselfly Naiad	-	2	-	2
Dragonfly Naiad	-	1	1	-
Leech	-	-	-	-
Sludgeworm	-	P	-	-
Total Kinds	0	9	5	3

P - Present - Various kinds of sludgeworms not determined

1 - Tentative identification

APPENDIX C

COMPUTATION OF OXYGEN SAG

APPENDIX C

COMPUTATION OF OXYGEN SAG

This appendix is concerned with the calculation of oxygen sag curves on the Lower Pearl River.

SURVEY PERIOD

Long-Term B.O.D.

Data on long-term B.O.D.'s are presented in Table A25. The K values, which were calculated on an electronic analog computer, are to the base *e*. Since the rate varied along the length of the river the factor $(1-e^{Kt})$ for various stations was proportioned to the time of passage and is shown in Table C1.

Time of Passage

Time of passage was determined by using Rhodamine B as a water mass tracer for a stream flow of approximately 1700 cfs. The time of passage to various stations from P-77 (drawbridge) is shown in Table C1.

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

TABLE NO. C-1

Station	Time of Passage, Hrs.	$1-e^{\lambda t}$
P77	0	0.67
P75	2.2	0.67
P73.5	3.9	0.66
P70.8	6.5	0.65
P63.5	14.2	0.63
P63.2	14.2	0.63
P60	17.9	
P56.7	21.4	0.60
P53.3	25.0	
P50.3	28.2	0.58
P46.3	32.5	0.56
P42.2	36.9	0.55

B.O.D.

The observed pounds of B.O.D. for various stations (from Appendix A) and the calculated ultimate B.O.D. (using functions from Table C1) are shown in Table C2. The average ultimate B.O.D. in river samples is plotted on Figure C1 and the range of values is also indicated. Curve No. 1 is for loads of 30,200 pounds per day at P-77, 51,000 pounds per day from Bogue Lusa Creek and K_1 values for the two loads of 0.192 per day. The fit is good for below Pool's Bluff (P-64), but there appears to be a greater load to the stream than the sum of 30,200 and 51,000 in order to account for the values at P-71.

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

CALCULATED ULTIMATE B.O.D., 1000 LBS./DAY

TABLE NO. C-2

Station	n	5-Day B.O.D. Avg.	Max.	Min.	R	Ult. B.O.D. Avg.	Max.	Min.
P77	10	20.2	33.6	10.1	23.5	30.2	50.1	15.1
P76	6	19.6	24.7	15.7	9.0	29.2	37	23.4
BLO	14	34.2	54.3	12.5	41.8	51.0	81.0	18.7
P74	3	60.4	83.2	38.3	44.9	91.5	136	58.0
P71	13	60.6	79.5	46.3	33.2	93.5	122.3	71.5
P64	16	48.7	58.7	39.7	19.0	77.5	93.4	63.0
P63	11	46.6	57.2	37.2	20.0	74.1	91	59.1
P57	10	43.0	59.4	33.0	26.4	71.9	99	55.0
P50	10	37.1	50.3	27.2	23.1	64.0	86.9	47.0
P46	3	35.9	37.3	34.6	3.7	64.2	66.5	61.9
P42	11	31.8	39.8	22.6	17.2	57.8	72.4	41.1

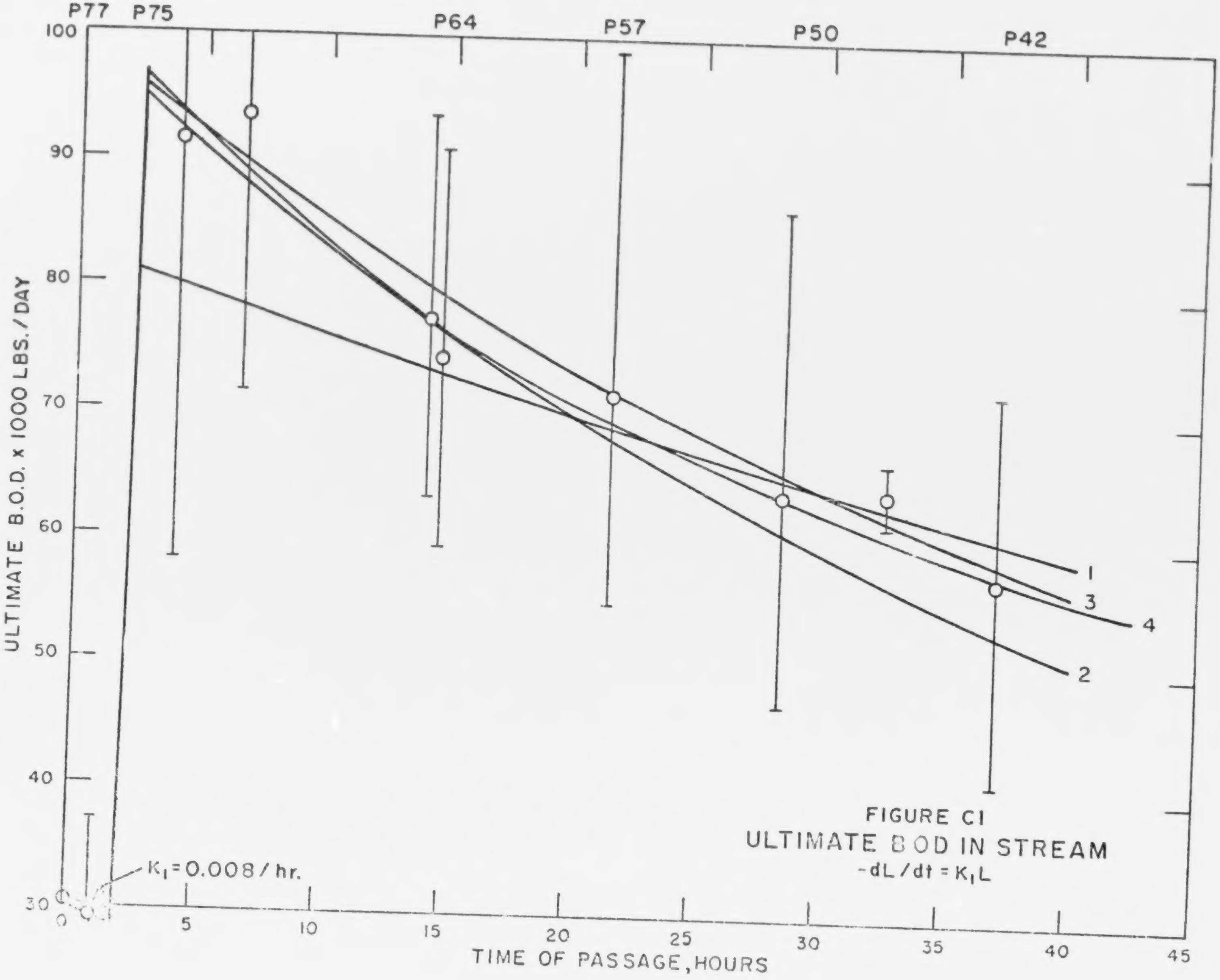

FIGURE C1
ULTIMATE BOD IN STREAM
$-dL/dt = K_1 L$

Curve No. 2 is for loads of 30,200 pounds per day at P-77, 67,000 pounds per day from Bogue Lusa Creek or vicinity, and a K_1 value of 0.26 per day at P-75. The curve is a better fit from P-75 to Pool's Bluff. Curve No. 3 is for the same conditions at P-77 and K_1 of 0.19 per day at P-75. This curve is a better fit below the Sill than the previous curve. These curves are all drawn by the X-Y plotter as a readout of the computations made on the analog computer. Computation values are shown in Table C3.

From the first three curves it appears that there is some additional B.O.D. load to the stream in excess of that in the stream at P-77 plus that coming from Bogue Lusa Creek. There is also a different K_1 value above the Sill than below as borne out by the long-term B.O.D. values in Table A25. It should also be kept in mind that the seed for all of these determinations was collected in the vicinity of P-77.

These factors can be simulated on the analog computer and Curve No. 4 is the result. The load from Bogue Lusa Creek was set at the observed value of 51,000 and a K_1 value of 0.19 per day. An additional load of 18,000 in the vicinity of P-75 is simulated and the K value (K_3) is estimated to have a high rate of 0.72 per day, perhaps a rapid removal of B.O.D. by sedimentation in the impounded area above the Sill. The K_1 rate was also changed at P-64 to better fit the observed downstream conditions, by adding ΔK_1 to the circuit at unit time 14.2.

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

VALUES OF K_1/HR. IN THE STREAM

TABLE NO. C-3

Curve	L_{77}	L_{75}	S_{75}	$K_{1(77)}$	$K_{1(75)}$	$\Delta K_{1(75)}$	$K_{3(75)}$
1	30.2	51	-	0.008	0.008	-	-
2	30.2	67	-	0.035	0.011	-	-
3	30.2	67	-	0.035	0.008	-	-
4	30.2	51	18	0.035	0.008	-0.006	0.03

D.O.

Having established estimated loads going to the stream which will simulate observed conditions in the stream, the next step in computation is to estimate values of oxygenation and reaeration constants to simulate observed dissolved oxygen conditions.

Table C4 is a tabulation of the average D.O. conditions during the survey. The deficits are plotted on Figure C2. Table C5 is a tabulation of values used in computing the curves plotted on Figure C2. Because of reaeration at the Sill the computations were handled as two separate problems, above and below the Sill. The total of the simulated ultimate B.O.D. (18,000) and the zero or less oxygen condition in Bogue Lusa Creek is estimated to be 21,000 pounds per day and the demand to be exerted at a very high rate (K_3) simulating an immediate oxygen demand of short duration. The observed average deficit at P-77 of 8,300 pounds per day is used in the computations.

Curve No. 1 (Figure C2) uses the K_1 values from Curve No. 4 (Figure C1) and it is assumed that there is no net reaeration. Curve No. 2 is for different values of K_1 in order to obtain a better fit and Curve No. 3 appears to be the best fit without changing the values of K_1 too severely from those previously estimated. The principal conclusion is that there is a heavy benthal demand which is assumed to equal the reaeration above the Sill.

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

AVERAGE D.O. DEFICIT, 1000 LBS./DAY

TABLE No. C-4

Station	n	Flow	°C	Sat. D.O.	D.O.	Deficit
P77	10	1905	25	86.2	77.9	8.3
P76	6	2072	25	93.8	84.4	9.4
BLO	13	50	30	2.1	0.0	2.1
P74	3	2178	28	93.1	64.6	28.5
P71	15	2012	25	91.0	57.4	33.6
P64	16	2018	25	91.3	43.8	57.5
P63	12	1986	25	89.9	61.9	28.0
P60	11	1957	25	88.6	60.1	28.5
P57	11	1957	24	90.1	59.7	30.4
P53	10	1941	24	89.4	58.8	30.6
P50	11	1957	25	88.6	57.5	31.1
P46	12	1965	25	88.9	55.8	33.1
P42	13	1976	25	89.4	58.4	31.0

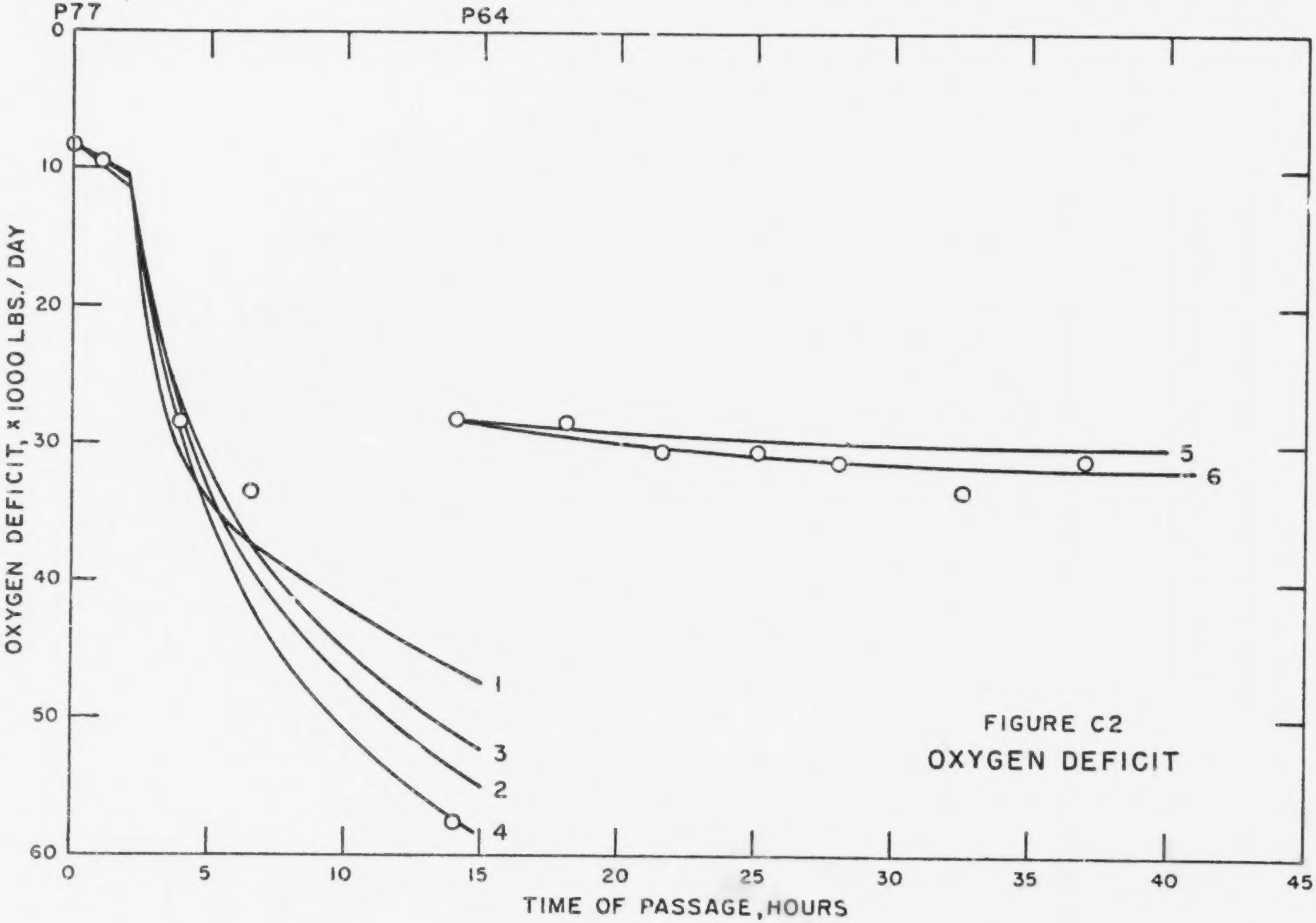

FIGURE C2
OXYGEN DEFICIT

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

VALUES OF K_1 and K_2/HR. IN THE STREAM

TABLE NO. C-5

ABOVE THE SILL

Curve	L_{77}	L_{75}	S_{75}	D_{77}	$K_{1(77)}$	$K_{1(75)}$	$K_{3(75)}$	K_2
1	30.2	51	21	8.3	0.035	0.008	1.0	0.00
2	30.2	51	21	8.3	0.05	0.015	0.5	0.00
3	30.2	51	21	8.3	0.04	0.015	0.5	0.00
4	30.2	51	21	8.3	0.04	0.05	0.5	0.015

BELOW THE SILL

	L_{64}	D_{64}	$K_{1(64)}$	K_2
5	77	28	0.010	0.02
6	77	28	0.012	0.022

Curve No. 4 (Figure C2) assumes a K_1 value of 1.2 per day for the observed B.O.D. load from Bogue Lusa Creek in order to account for the benthal demand and the reaeration constant K_2 then has a value of 0.36 per day. This K_1 value of 1.2 is about 5 times the value determined in the long-term B.O.D. bottles.

For deficit curves below the Sill, the ultimate B.O.D. load is estimated at P-64, from Figure C1, to be 77,000 pounds per day and the observed average D.O. deficit of 8,300 pounds per day below the Sill is used. Curves No. 5 and No. 6 are two estimates of the values below the Sill, which are tabulated in Table C5. Curve No. 6 appears to be best fit obtainable with the computer, and K_2 has a value of 0.53 per day. Using Churchill's method[11] the K_2 values for this stream would be expected to fall between 0.4 and 0.6 per day.

The ratio of oxygen deficits in the stream above and below the Sill are plotted against flow rates, in Figure C3, in order to estimate the reaeration to be expected as the water falls over the dam.

The simulating analog computer circuit may be represented as shown in Figure C4.

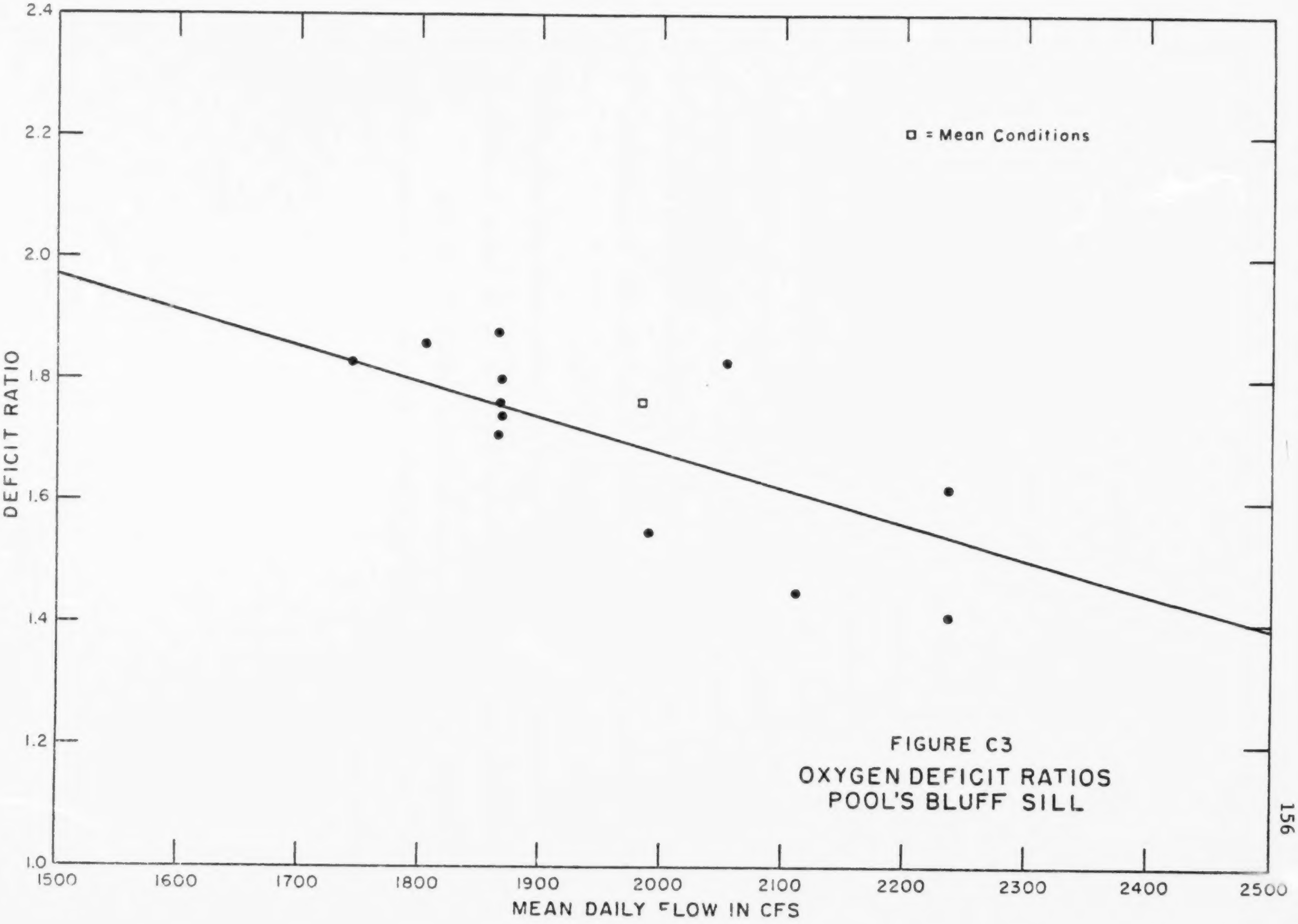

FIGURE C3

OXYGEN DEFICIT RATIOS
POOL'S BLUFF SILL

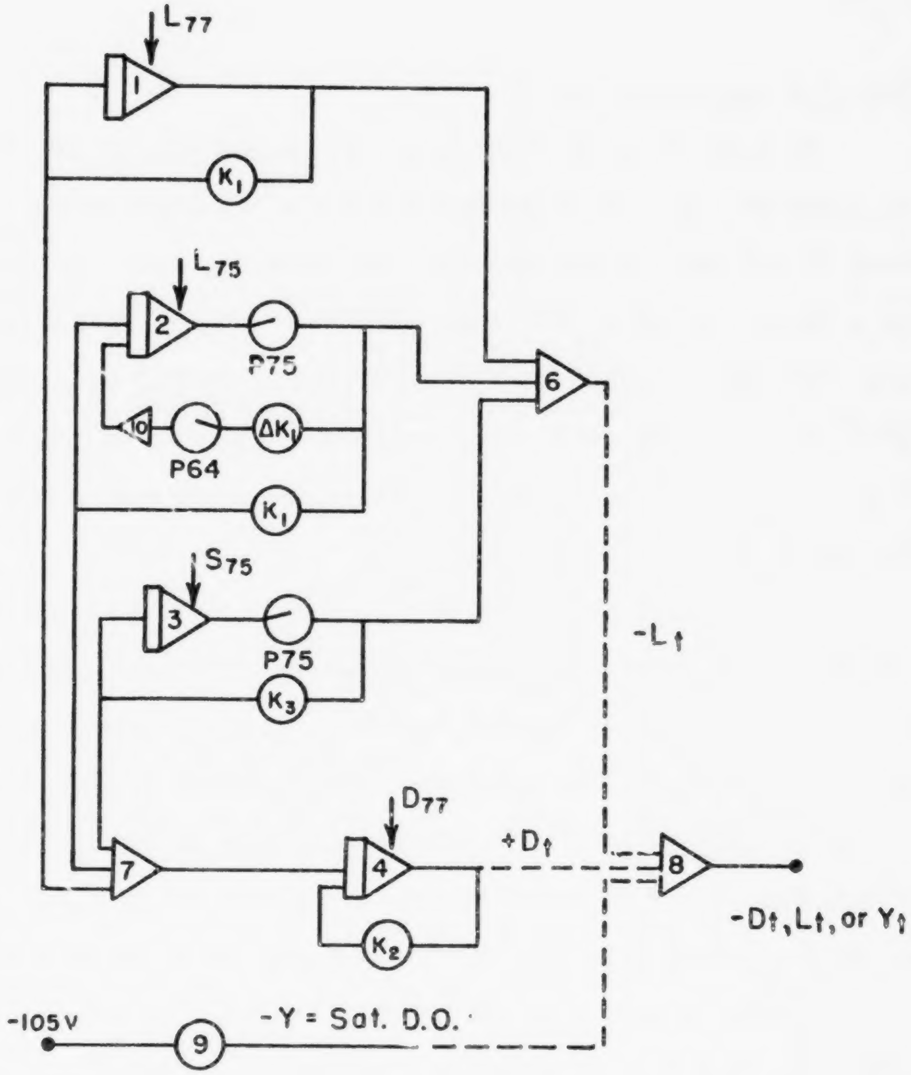
L77
1
K1
L75
2
P75
10
P64
ΔK1
K1
6
S75
3
P75
K3
-Lt
D77
7
4
+Dt
8
-Dt, Lt, or Yt
K2
-105v
9
-Y = Sat. D.O.

FIGURE C4

ANALOG COMPUTER CIRCUIT

Projected Oxygen Deficits

In order to estimate the future oxygen deficits at low flows, two different load conditions were assumed at the mouth of Bogue Lusa Creek (P-75), one for the observed load during the survey and the other for a future load of 62,000 pounds per day of primary treated pulp and paper mill wastes. Any wastes discharged from the City of Bogalusa after the sewage treatment plant is in operation were considered negligible if no oxidation is assumed to take place in the mill wastes during the time of passage in Bogue Lusa Creek.

Table C6 is a tabulation of the values submitted to the analog computer and the results obtained. Values of dissolved oxygen in thousands of pounds per day were the values plotted or drawn by the computer. Ultimate B.O.D. and oxygen deficit values at P-64 were read out on the computer voltmeter. Values were computed for the reach from P-77 to P-64, above the Sill, the reaeration over the Sill was estimated by deficit ratios, (Fig. C3) and a second computation was made from P-64 to below the downstream sag point. Some selected curves are reproduced on Figure C5. Curves for dissolved oxygen in mg/l are presented in Fig. 10 of the main part of the report.

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

OXYGEN SAG CALCULATIONS

TABLE NO. C6

					PTT									BLO			
Curve No.	Flow cfs	Temp. °C	Sat. D.O. mg/1	Sat. D.O. 1000#/day	D.O. mg/1	D.O. 1000#/day	Def. 1000#/day	K_2/day	K_2/hr.	B.O.D. mg/1	Ult. B.O.D. 1000#/day	K_1/day	K_1/hr.	B.O.D. 1000#/day	Ult. B.O.D. 1000#/day	K_1/day	K_1/hr.
1	2000	25	8.4	90.6	8.0	86.2	4.4	0.00	0.00	2.0	31.6	0.96	0.04	34.0	50.0	0.36	0.015
2	2000	25	8.4	90.6	8.0	86.2	4.4	0.36	0.015	2.0	31.6	0.96	0.04	34.0	50.0	1.20	0.05
3	2000	25	8.4	90.6	8.0	86.2	4.4	0.00	0.00	2.0	31.6	0.96	0.04	45.0	67.5	0.36	0.015
4	2000	25	8.4	90.6	8.0	86.2	4.4	0.36	0.015	2.0	31.6	0.96	0.04	45.0	67.5	1.20	0.05
5	2000	30	7.6	82.0	7.0	75.5	6.5	0.00	0.00	2.0	31.6	1.25	0.05	34.0	50.0	0.45	0.019
6	2000	30	7.6	82.0	7.0	75.5	6.5	0.45	0.019	2.0	31.6	1.25	0.05	34.0	50.0	1.5	0.062
7	2000	30	7.6	82.0	7.0	75.5	6.5	0.00	0.00	2.0	31.6	1.25	0.05	45.0	67.5	0.45	0.019
8	2000	30	7.6	82.0	7.0	75.5	6.5	0.45	0.019	2.0	31.6	1.25	0.05	45.0	67.5	1.5	0.062
9	1500	25	8.4	68.0	8.0	65.0	3.0	0.00	0.00	2.0	24.2	0.96	0.04	34.0	50.0	0.36	0.015
10	1500	25	8.4	68.0	8.0	65.0	3.0	0.36	0.015	2.0	24.2	0.96	0.04	45.0	67.5	1.20	0.05
11	1500	30	7.6	61.5	7.0	56.7	4.8	0.00	0.00	2.0	24.2	1.25	0.05	34.0	50.0	0.45	0.019
12	1500	30	7.6	61.5	7.0	56.7	4.8	0.45	0.019	2.0	24.2	1.25	0.05	45.0	67.5	1.5	0.062
13	1100	25	8.4	49.8	8.0	47.5	2.3	0.00	0.00	2.0	11.9	0.96	0.04	34.0	50.0	0.36	0.015
14	1100	25	8.4	49.8	8.0	47.5	2.3	0.36	0.015	2.0	11.9	0.96	0.04	45.0	67.5	1.20	0.05
15	1100	30	7.6	45.0	7.0	41.5	3.5	0.00	0.00	2.0	11.9	1.25	0.05	34.0	50.0	0.45	0.019
16	1100	30	7.6	45.0	7.0	41.5	3.5	0.45	0.019	2.0	11.9	1.25	0.05	45.0	67.5	1.5	0.062
Primary Sedimentation - No Benthal Demand															**BLO = Zero D.O.**		
17	2000	25	8.4	90.6	8.0	86.2	4.4	0.36	0.015	2.0	31.6	0.96	0.04	45.0	67.5	0.36	0.015
18	2000	30	7.6	82.0	7.0	75.5	6.5	0.45	0.019	2.0	31.6	1.25	0.05	45.0	67.5	0.45	0.019
19	1500	30	7.6	61.5	7.0	56.7	4.8	0.45	0.019	2.0	24.2	1.25	0.05	45.0	67.5	0.45	0.019
20	1100	25	8.4	49.8	8.0	47.5	2.3	0.36	0.015	2.0	11.9	0.96	0.04	45.0	67.5	0.36	0.015
Future Condition - 62,000 lbs. B.O.D./day																	
21	2000	25	8.4	90.6	8.0	86.2	4.4	0.36	0.015	2.0	31.6	0.96	0.04	62.0	92.5	0.36	0.015
22	2000	30	7.6	82.0	7.0	75.5	6.5	0.45	0.019	2.0	31.6	1.25	0.05	62.0	92.5	0.45	0.019
23	1500	30	7.6	61.5	7.0	56.7	4.8	0.45	0.019	2.0	24.2	1.25	0.05	62.0	92.5	0.45	0.019
24	1100	25	8.4	49.8	8.0	47.5	2.3	0.36	0.015	2.0	11.9	0.96	0.04	62.0	92.5	0.36	0.015
24A	1100	30	7.6	45.0	7.0	41.5	3.5	0.45	0.019	2.0	11.9	1.25	0.05	62.0	92.5	0.45	0.019
Low Reaeration Rates																	
25	1500	30	7.6	61.5	7.0	56.7	4.8	0.22	0.009	2.0	24.2	1.25	0.05	62	92.5	0.45	0.019
26	1500	30	7.6	61.5	7.0	56.7	4.8	0.22	0.009	2.0	24.2	1.25	0.05	62	92.5	1.25	0.051
27	1500	30	7.6	61.5	7.0	56.7	4.8	0.22	0.009	2.0	24.2	1.25	0.05	62	92.5	0.45	0.019
Changed Conditions at PTT (See No. 23)																	
28	1500	30	7.6	61.5	6.0	48.5	13.0	0.45	0.019	3.0	36.3	1.25	0.05	62	92.5	0.45	0.051
29	1500	30	7.6	61.5	6.0	48.5	13.0	0.22	0.009	3.0	36.3	1.25	0.05	62	92.5	0.45	0.051

PEARL RIVER SURVEY - LOUISIANA-MISSISSIPPI

OXYGEN SAG CALCULATIONS
(Cont'd.)

TABLE NO. C6

			P75 Immed. Demand			P63.5						P63.2				Sag Point		
Curve No.	Flow cfs	Temp. °C	B.O.D. 1000#/day	Ult. B.O.D. 1000#/day	K_3/hr.	Ult. B.O.D. 1000#/day	K_1/day	K_1/hr.	D.O. 1000#/day	D.O. mg/1	Def. 1000#/day	Def. Ratio	Def. 1000#/day	K_2/day	K_2/hr.	Time Hrs.	D.O. 1000#/day	D.O. mg/1
1	2000	25	12.0	18.0	0.50	62.0	0.29	0.012	45.5	4.2	44.5	1.7	26.2	0.53	0.021	32.5	62.5	5.8
2	2000	25	12.0	18.0	0.50	47.0	0.29	0.012	38.0	3.5	52.0	1.7	30.6	0.53	0.021	14.2	59.7	5.5
3	2000	25	-	-	-	77.0	0.29	0.012	62.0	5.8	29.0	1.7	17.2	0.53	0.021	50+	63.7	5.9
4	2000	25	-	-	-	56.0	0.29	0.012	47.5	4.3	44.0	1.7	25.8	0.53	0.021	27.5	64.5	6.0
5	2000	30	12.0	18.0	0.63	56.0	0.36	0.015	31.0	2.9	52.0	1.7	30.6	0.67	0.028	14.2	50.5	4.7
6	2000	30	12.0	18.0	0.63	41.0	0.36	0.015	25.0	2.3	58.0	1.7	34.1	0.67	0.028	14.2	47.0	4.4
7	2000	30	-	-	-	71.0	0.36	0.015	45.0	4.2	36.5	1.7	21.4	0.67	0.028	40.0	55.0	5.1
8	2000	30	-	-	-	48.5	0.36	0.015	32.0	3.0	50.3	1.7	29.6	0.67	0.028	14.2	51.5	4.8
9	1500	25	12.0	18.0	0.50	57.0	0.29	0.012	28.0	3.5	40.0	2.0	20.0	0.53	0.021	41.0	43.9	5.4
10	1500	25	-	-	-	51.0	0.29	0.012	27.5	3.4	40.0	2.0	20.0	0.53	0.021	36.5	45.0	5.6
11	1500	30	12.0	18.0	0.50	52.0	0.36	0.015	17.5	2.2	45.0	2.0	22.5	0.67	0.028	25.0	37.0	4.6
12	1500	30	-	-	-	44.0	0.36	0.015	17.3	2.1	46.0	2.0	23.0	0.67	0.028	14.2	37.3	4.6
13	1100	25	12.0	18.0	0.5	50.0	0.29	0.012	15.0	2.5	33.5	2.2	15.3	0.53	0.021	50+	30.0	5.1
14	1100	25	-	-	-	44.0	0.29	0.012	15.0	2.5	34.5	2.2	15.7	0.53	0.021	47.5	31.9	5.4
15	1100	30	12.0	18.0	0.5	46.0	0.36	0.015	6.6	1.1	38.0	2.2	17.3	0.67	0.028	31.0	26.1	4.4
16	1100	30	-	-	-	38.0	0.36	0.015	5.0	0.8	40.0	2.2	18.2	0.67	0.028	15.0	26.5	4.5
17	2000	25	2.2	2.2	1.0	77.0	0.29	0.012	63.5	5.9	28.0	1.7	16.5	0.53	0.021	55.0	64.5	6.0
18	2000	30	2.1	2.1	1.0	72.0	0.36	0.015	50.0	4.6	32.0	1.7	18.8	0.67	0.028	42.0	57.8	5.4
19	1500	30	2.1	2.1	1.0	68.0	0.36	0.015	33.8	4.2	28.0	2.0	14.0	0.67	0.028	47.0	40.0	4.4
20	1100	25	2.2	2.2	1.0	63.0	0.29	0.012	32.0	5.4	19.0	2.2	8.6	0.53	0.021	60.0	30.0	5.0
21	2000	25	2.2	2.2	1.0	97.0	0.29	0.012	60.0	5.6	32.0	1.7	18.8	0.53	0.021	60.0	59.0	5.5
22	2000	30	2.1	2.1	1.0	91.0	0.36	0.015	45.3	4.2	38.0	1.7	22.4	0.67	0.028	41.5	51.8	4.7
23	1500	30	2.1	2.1	1.0	87.0	0.36	0.015	29.0	3.6	32.5	2.0	16.3	0.67	0.028	49.0	33.9	4.2
24	1100	25	2.2	2.2	1.0	86.0	0.29	0.012	28.5	4.8	22.0	2.2	10.0	0.53	0.021	65.0	23.9	4.0
24A	1100	30	2.1	2.1	1.0	80.0	0.36	0.015	20.0	3.0	25.0	2.2	11.4	0.67	0.028	54.0	20.8	3.1
25	1500	30	2.2	2.2	1.0	87.0	0.36	0.015	26.0	3.2	36.0	2.0	18.0	-	0.014	65.0	22.0	2.7
26	1500	30	2.2	2.2	1.0	65.0	0.36	0.015	4.0	0.5	58.0	2.0	29.0	-	0.014	43.0	24.3	3.0
27	1500	30	5.0	5.0	0.6	87.5	0.36	0.015	23.5	2.9	38.0	2.0	19.0	-	0.014	65.0	21.2	2.6
28	1500	30	5.0	5.0	0.6	70.0	0.36	0.015	0.0	0.0	70.0	2.0	35.0	-	0.028	17.5	26.1	3.2
29	1500	30	5.0	5.0	0.6	70.0	0.36	0.015	0.0	0.0	75.0	2.0	37.5	-	0.014	48.0	16.0	2.0

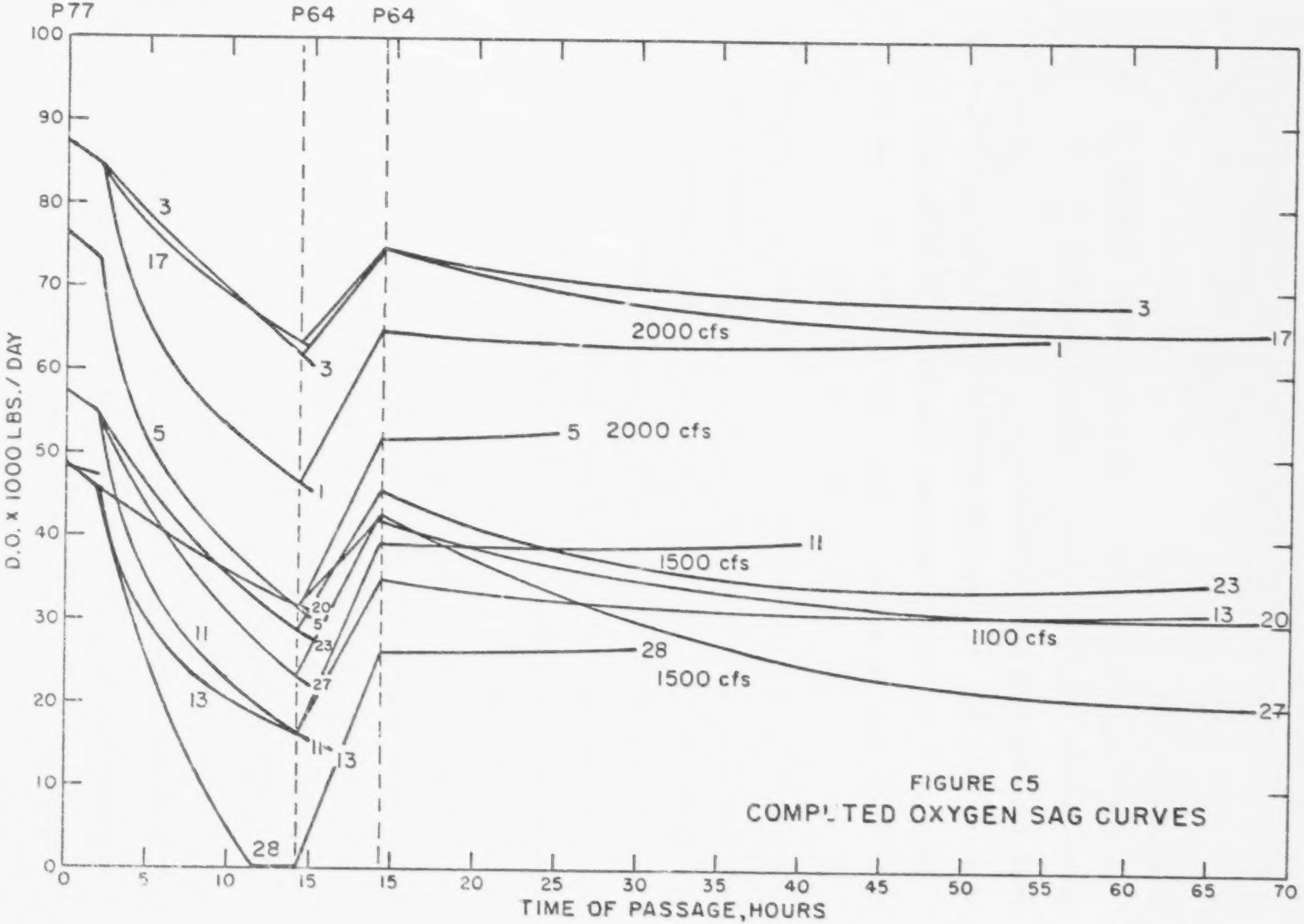

FIGURE C5
COMPUTED OXYGEN SAG CURVES

Existing Waste Load

Curves 1 through 4 were for conditions similar to those for the survey period. For Curves 1 and 3 the benthal demand was assumed to equal the reaeration and that there was no net reaeration. In Curve 1 it was assumed that there was immediate demand load applied at P-75, in addition to the observed discharge from Bogue Lusa Creek, while in Curve 3 the immediate demand was deleted and the load from Bogue Lusa Creek was increased accordingly. The conditions for Curve 3 do not appear to be a satisfactory analogy. For Curves 2 and 4 the benthal demand was represented by a higher value of K_1, and K_2 was estimated to be 0.36 per day. Curve 2 assumed an immediate demand from Bogue Lusa Creek, while Curve 4 increased the total load from Bogue Lusa Creek to adjust for the immediate demand, similar to Curve 3. Curve 4 gave about the same result at P-64 as Curve 1. Curve 2 appeared to represent an unduly severe condition.

Curves 5 through 8 are similar to the previous curves, except a water temperature of 30°C (86°F) was assumed. Similar comments may be made and Curves 6 and 7 are not considered to be analogous to stream conditions.

Curves 9 through 12 are for flows of 1,500 cfs, which may occur for at least one day each year. At a water temperature of 30°C, the D.O. may be expected to be less than 3 mg/l above Pool's Bluff Sill under waste discharge conditions such as those existing during the period of the survey.

Curves 13 through 16 are for stream flows of 1,100 cfs, which may prevail for a period of seven days, once in ten years. Nuisance conditions would be expected above Pool's Bluff Sill if the mill wastes are not improved over conditions during the survey.

Existing Load with Sedimentation

Curves 17 through 20 represent a load of 45,000 pounds per day of B.O.D. from Bogue Lusa Creek without any immediate demand or any benthal demand, as would be expected if the mill wastes are treated by primary sedimentation. For the assumed conditions, the D.O. in the stream would not be less than 4 mg/1.

Future Conditions

Curves 21 through 24A are for a future load of 62,000 pounds per day of B.O.D. from Bogue Lusa Creek after primary treatment of the mill wastes.

In the various hypothetical conditions, the constants were assumed to not change substantially with rate of stream flow. Curves 25, 26, and 27 are for lower reaeration rate with flows of 1,500 cfs at 30°C; a generally more critical condition than 1,100 cfs at 25°C. Curve 26 assumes a benthal demand represented by a high K_1 rate, and nuisance conditions would be expected above Pool's Bluff Sill. For Curves 25 and 27 the D.O. would be expected to be less than 3 mg/l below the Sill, with the sag occurring 65 hours below P-77.

In all of the previous 27 cases, it was assumed that the conditions at P-77 could be represented as 2 mg/l of B.O.D., 8 mg/l D.O. at 25°C and 7 mg/l D.O. at 30°C. For the same conditions as for Curve 23, except 6 mg/l D.O. and 3 mg/l B.O.D. at P-77, the condition above Pool's Bluff Sill would be very unsatisfactory with anaerobic conditions to be expected.

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CHAIRMAN STEIN: Thank you, Mr. Fairall.

Are there any comments or questions?

MR. LAFLEUR: I would have one question, Mr. Chairman. Mr. Fairall, on Page 39, where we get into these growth ratings on fishes, I checked your reference there. Of course, he is a respected authority dealing with fisheries. However, I note he is from Iowa. This is not necessarily bad, but I do question, however, the growth length in inches, as we believe we know it in Louisiana. I suspect that our growth rate is just a little bit faster than you represented in the case of most of these fishes, particularly the channel cat. I don't think we would take three years to grow an 8 to 16-inch catfish in Louisiana.

CHAIRMAN STEIN: I didn't know you grew them that small.

MR. LAFLEUR: We grow them big, too.

CHAIRMAN STEIN: Would you accept that comment?

MR. FAIRALL: Yes, I think so. I see no reason to doubt it.

CHAIRMAN STEIN: As I understand the situation of what happened, you were very polite when you said "unusual discharge." What happened was that the fish were wiped out, and it is going to take some time for them to come back.

MR. FAIRALL: Right.

CHAIRMAN STEIN: It is pointed out that in Louisiana fish may grow a little faster and a little larger than in some other places. By the way, on the basis of my experience from just what I've seen, I can believe that.

MR. LAFLEUR: I would comment a little bit about some of the aquatic life that we know about here in Louisiana, as contrasted to what you might find, for example, in the case of the oysters in Chesapeake Bay. I understand it takes a minimum of about three years to grow a marketable size oyster; whereas, in Louisiana we have very few oysters whose ages are at or exceed three years. Their metabolism is much faster -- and they live faster, as we all do. (Laughter)

CHAIRMAN STEIN: Do you have any comments, Mr. Trygg?

MR. TRYGG: I have one question I would like to ask. That is on Page 22. I think I previously asked that, regarding the authorities who have set the recreational standards at 1,000, and the general use and water supplies at 5,000. I believe I understand the latter one, but the first one of 1,000 -- who are the authorities?

MR. FAIRALL: You see it quite often in the literature. I don't know if you can attribute it to any single individual or single group of authorities. It occurs so commonly that we did not look up a particular reference on it.

MR. TRYGG: We quite accidentally used 1,000 down here, but my experience was that it wasn't common. I have searched everyplace to find that figure, and couldn't find it.

MR. FAIRALL: Well, if you want to find this figure, I think I've seen it in print in the Missouri River Basin Agency. I've forgotten what their official title is, but I think that will give you enough of a lead that you can follow up on it, or I can get the exact title for you.

MR. TRYGG: Thank you.

CHAIRMAN STEIN: We looked into that the other day in Washington. As a matter of fact, that is a very good point you have raised. I don't know that there is any general consensus, but it is believed that most state authorities, if you take the largest number of states that have any number except 1,000, this does not mean that this is the majority of the states, or most, or the majority of authorities; but what interests me was that even though we may talk about the 1,000, as I read the report on Page 38, it says, "all stations showed an average total coliform density of 5,000," which is considered to be the upper limit.

Now in other words, while we may talk or argue about the 1,000, when Mr. Fairall points out that the coliform count here was 5,000, I think the argument that 5,000 is acceptable, I imagine you would probably get a greater uniformity of opinion.

MR. TRYGG: I have no argument. I was looking for information. As far as the 5,000 is concerned, my comment would be that our water contact sports are limited on Pearl River. I have no objection. I was just looking for information.

CHAIRMAN STEIN: Thank you. In other words -- let this be off the record.

(Discussion off the record.)

CHAIRMAN STEIN: We will go on the record again.

Are there any more questions or comments from Louisiana? How about Mississippi?

MR. JOHNSTON: None.

CHAIRMAN STEIN: Do you have any comments, Mr. Taylor?

MR. TAYLOR: No.

CHAIRMAN STEIN: I wonder if we could just to see if I can perhaps see if I understood what you said. I think the situation may be easier to understand than a lot of other pollution cases because there don't seem to be many major sources. As far as I can understand, you are saying that the municipal waste discharges from Bogalusa, Louisiana are creating bacteriological problems, which inhibit the use of water contact sports and other purposes, constituting interstate pollution under the Act; that Crown Zellerbach puts in discharges which deplete the oxygen, interfere with fish life and the assimilative capacity of the stream; and that has an effect on interstate waters and constitutes, in your opinion, pollution under the Federal Act.

The Crosby Chemical Company, now would you say that the discharges from there have an interstate effect, other than the spills?

MR. FAIRALL: I think it has some. It was certainly not recovered during the period of the survey. When we reached the interstate waters, we were down below our 5.0 mg/l objective.

CHAIRMAN STEIN: Right. However, I am just trying to understand this.

The Town of Picayune; would you say that the bacteria discharged from that has an interstate effect?

MR. FAIRALL: Definitely; yes.

CHAIRMAN STEIN: Now as far as the shellfish beds, there is no demonstrable effect, as I understand it; but the recommendation is that further studies be done during other periods of flow to see if there could be a possible effect.

MR. FAIRALL: That is true because this sanitary survey indicated that there are definitely potential hazards there, upstream, and these should be watched, I should say.

MR. TRYGG: May I make a comment?

CHAIRMAN STEIN: Yes, sir.

MR. TRYGG: I was a little bit surprised to see that statement, because anyplace that oysters grow, there are potential hazards, I don't care where you go in the country. This is taken for granted because this is one of the necessary things to oyster growth.

Secondly, in regards to Bogalusa, as you have pointed out, they were in the process of completing a treatment plant. I think it is a matter of record to say that approximately six to seven thousand people are discharging raw sewage into the river, which has a direct effect. But the other quantity or the other number of people are now having their sewage primary treated with chlorination, and this is one of the unknowns that we must determine, what effect this had made on the over-all coliform content.

CHAIRMAN STEIN: I would thoroughly agree with you, Mr. Trygg. You know we have always had this problem in the field, and I'm not sure it isn't a semantic one. When we talk about potential hazards, I don't know how redundant that is. A hazard seems to me a kind of potential, anyway. That is what a hazard is supposed to be. I think, in dealing with the shellfish industry, that is why we are so careful and have all these checks. I don't think there is any implication here that these shellfish beds are not safe, as we know them. But they need constant vigilance.

Now let me see again if I understand this, just to get the facts and further comments on this. As I understand it, the BOD loading of Crown Zellerbach at Bogalusa is 76,167.

MR. FAIRALL: That was from the State of Louisiana's average values.

CHAIRMAN STEIN: And the proposed reduction would put in 62,000 pounds.

MR. FAIRALL: Again, according to Louisiana's report.

CHAIRMAN STEIN: Yes. Assuming that. I don't know, unless we come up with some further information, that there is any reason to doubt it. That is a reduction of 14,000 pounds, or would be a reduction of 20 per cent. Is that correct?

MR. FAIRALL: I think you are aware that this 76,000 pounds of B.O.D. was probably at a mill operation of somewhere around 900 tons, roughly; and the 62,000 pounds would be the waste from 1500 tons of production. So you've got that factor in there, too, if you are concerned with that.

CHAIRMAN STEIN: Oh, you mean the production has gone up?

MR. FAIRALL: Well, I understand from Louisiana's report that Crown Zellerbach proposes to increase their production to 1500 tons, along with putting in this primary treatment.

CHAIRMAN STEIN: Yes. But as far as the stream is concerned, the real effect is what goes in the stream.

MR. FAIRALL: Well, yes.

CHAIRMAN STEIN: This is always the problem. If you get a little town removing 90 per cent of their wastes on, say the Mississippi River, you don't see it. But then, you get a place like St. Louis or Chicago, removing 90 per cent of their wastes, you still may have a polluted situation.

The question here, I don't think, is necessarily, as I see this, although it's commendable and we hope everyone increases their production; but the key point in pollution is that if you had a polluted condition at 76,000 pounds, the reduction of 20 per cent is just going to be a reduction of 20 per cent from the stream, no matter how much they increase their production -- plant production.

I have no other questions.

I wonder if we could, before we begin to take the state presentations, if we could take a recess of ten minutes to give us a chance to get up and stretch?

(A short recess was taken.)

CHAIRMAN STEIN: May we reconvene? Mr. Lafleur.

MR. LAFLEUR: Mr. Chairman and member conferees:

I have a statement here for presentation to the conference that I would request be made a matter of record.

I would like to observe at this point that Louisiana's Water Pollution Control Authority did not request that the U. S. Public Health Service enter the matter of pollution of Pearl River. To deny, however, that this interstate stream between Louisiana and Mississippi suffers from the ills of pollution would be to ignore reality, for since its formation in 1940, Louisiana's Water Quality Authority, the Louisiana Stream Control Commission, has been faced with the problem of pollution abatement on Pearl River. Our files actually date back to 1941, and contain petitions and other communications alleging and complaining of pollution on Pearl River. At least four moderate to severe fish kills have been recorded and observed by the staff of the Division of Water Pollution, Louisiana Wild Life and Fisheries Commission, within the past twelve years in the stretch of Pearl River from Bogalusa, Louisiana, to Walkiah Bluff, a distance of approximately thirty miles.

The basic policy and philosophy of the Louisiana Stream Control Commission has not been to penalize, or threaten to penalize, offending industries and municipalities, but rather to work with such groups in an atmosphere of patience, tolerance, forbearance, and particularly cooperation. The goal of Louisiana's Water Quality Authority has been to maintain and/or improve the quality of surface waters for multi-purpose uses. Among the aforementioned uses are agricultural irrigation, recreation, sport and commercial fishing, and industrial and municipal uses. Included among the latter is carrying away man's industrial and municipal waste discharges. We ascribe to the philosophy that dilution is a solution to pollution, to the extent that the legitimate uses of others are not infringed upon, and that waste treatment for mere sake of treatment is unnecessary. It must also be noted that stream classification and attendant stream standards have, to date, been pointedly avoided in this state. We are considered by some to be a water-rich state; however, in some geographical areas this is not entirely true. I must also observe that Louisiana is, in the case of the majority of its river basins, the most downstream state.

In August 1960, the Louisiana Stream Control Commission requested that its enforcement and investigative arm, the Division of Water Pollution Control of the Louisiana Wild Life and Fisheries Commission, submit for consideration, recommendations on possible water quality standards in Pearl River. This request was preceded very shortly by a severe fish kill in Pearl River, when dead and dying fish were observed in the river for a distance of approximately thirty miles, from the confluence of Bogue Lusa Creek and Pearl River to a point known as Walkiah Bluff. In order to carry out this assignment, the staff of the Division of Water Pollution Control initiated, in March 1961, a chemical and biological survey program on the River. This survey extended through July 1962. In August 1962, a report was submitted to the Louisiana Stream Control Commission stating, and I quote from the abstract of this report:

"There is evidence to support the fact that the water quality of Pearl River is markedly lowered from its confluence with Bogue Lusa Creek to at least Walkiah Bluff, a distance of approximately thirty miles. The aquatic fauna population in the river is markedly altered in that same area of Pearl River."

From the summary and conclusion of the aforementioned report the following comments are worthy of note:

1. Dissolved oxygen "sags" are apparent at two points in the Pearl. One point is nine miles downstream from the confluence of Bogue Lusa Creek and Pearl River, and the other was found approximately twenty miles below the previously mentioned confluence.

2. Very susceptible clean water benthic forms are absent throughout the area studied, from Bogue Lusa Creek to Walkiah Bluff, primarily because of lowered dissolved oxygen content.

3. Moderately tolerant benthic forms are absent from Bogue Lusa Creek to eight to ten miles below Pool's Bluff by virtue of blanketing of the bottom with heavy deposits of solids.

4. A great increase in absolute and relative abundance of highly tolerant benthic forms was noted from Bogue Lusa Creek to Pool's Bluff, a point nine miles downstream from the confluence of Bogue Lusa Creek and Pearl River.

5. There is a possible increase in the abundance of fish life in the area studied during the periods of high water, accompanied by a decrease in the abundance of fish life and tendency toward its limitation to tolerant forms during the normal low water levels.

It must, then, be obvious that there is basic and general agreement with the report as presented by the U. S. Public Health Service.

At this point, it would seem, a brief review of the actions and efforts of Louisiana's Water Quality Authority to abate pollution in Pearl River is in order. In August of 1960, following a severe fish kill, a Notice of Determination was issued by the Louisiana Stream Control Commission to the party responsible. Shortly thereafter in October 1960, the required answer was submitted by the industry involved. In November 1962, the Louisiana Stream Control Commission approved the proposal for an increase in productive capacity by a major industry discharging its waste to the Pearl River. This would appear to increase the waste load that must be carried by Pearl River. However, the proposal of the industry indicated that a maximum B.O.D. discharge of 62,000 lbs/day would result from this increased production as treatment for their entire waste was to be furnished. This is compared with an average for fourteen samplings, over a seventeen-month period of 76,167 lbs/day B.O.D. discharge in which the range of these loads was found to be from 26,901 lbs/day to 129,923 lbs/day. These treatment facilities along with new municipal treatment facilities will, I am sure, be amply described at the appropriate time. Moreover, the industry was informed that, in keeping with the Louisiana Stream Control Commission policy, if pollution occurred they would be expected to take the necessary corrective measures.

The pollutional effect of the organic load discharged to the Pearl River has been greatly increased this year because of extremely low rainfall and resulting low flow in the river during the period of high water temperatures. Industry did institute some remedial measures to lessen the polluted conditions of Pearl River.

This, gentlemen, is a resume of the status of pollution and its abatement in Pearl River as the Louisiana Stream Control Commission views the matter to date.

Now, Mr. Chairman, is it in order at this time that we call on members?

CHAIRMAN STEIN: Let us see if we have any comments or questions.

MR. JOHNSTON: No questions.

CHAIRMAN STEIN: I have one question. Would you say it is correct, Mr. Lafleur, to indicate that the critical time for oxygen depletion in the river deals with the propagation of fish during the spawning season?

MR. LAFLEUR: Yes, it does.

CHAIRMAN STEIN: I have no further questions.

The comment I have is that, generally speaking, in dealing with pollution control, you are dealing with a peak or a critical point at one time or another. I think possibly one of the better ways to explain this is to take an example of an electric utility. You have to have the electric utility working, say at 4:00 o'clock on a December afternoon, when the men are still at their offices flicking on the lights, and the ladies are at home putting on their lights and using the appliances. If the utility doesn't work at the critical time, then you run into problems.

Now with water pollution control this critical time generally comes with low flow; or, in dealing with fish or the fish population, two things can happen. Either you can have a broad fish kill when, as indicated here, it takes years for the fish to come back; or else, if you have a condition where fish can't survive, or the fish can't recreate or propogate, you are going to have a downward trend in population. This is something to keep in mind.

A word about the procedure. On the advice of the local experts here, which I esteem very highly, it is recommended that we proceed until 12:30, and then we adjourn for lunch until 2:00. So with that in mind, when the next people are going to be called, when it gets pretty close to 12:30, just keep in mind that at that time we are probably going to call for a break.

Mr. Lafleur?

MR. LAFLEUR: Thank you, Mr. Chairman.

The first speaker that I have, that was invited to make a statement, is Mrs. David H. Wallace, Director, Oyster Institute of North America. Mrs. Wallace?

(No response.)

MR. LAFLEUR: Then, the next one I have on my list is Mr. Ray Dahl, Resident Manager of the Gaylord Division of Crown Zellerbach Corporation, Bogalusa, Louisiana.

MR. C. R. DAHL: Mr. Chairman and conferees:

My name is C. R. Dahl. I live in Bogalusa, Louisiana where I am Resident Manager of the Crown Zellerbach Corporation Pulp and Paper Mill.

At the invitation of the Louisiana Conferee, the Louisiana Stream Control Commission, I have been asked to discuss Crown Zellerbach's interest in the Pearl River and how this interest has and will contribute to effective and permanent improvement in the water quality of this stream. Our program has been developed with close cooperation and consultation between Crown Zellerbach and the Louisiana Stream Control Commission and its staff.

We received a copy of the Pearl Report by the U. S. Department of Health, Education, and Welfare on October 1, 1963. It is not my purpose here today to discuss or contest the technical information or conclusions contained in this report. Instead, I would like to review briefly the background surrounding the operations of Crown Zellerbach's mill in Bogalusa and the steady progress we have made and plan to make in our effluent control as it relates to the water quality of the Pearl River.

Certainly all of us here share an interest in the Pearl River. In fact, it is the Pearl River that makes possible the operation of a paper mill in Bogalusa, and we recognize that our utilization of this multi-purpose stream is but one use of this important water resource shared by the people of Louisiana and Mississippi.

Water is one of the indispensable materials for the manufacture of pulp and paper. Water is used in the papermaking process for cooking, washing, screening, cooling, steam production, and in conveying the various process materials. In the process of making paper, very little water is consumed. Large quantities are used and re-used many times in the process; but ultimately, the discharge rate is approximately the same as the water intake rate. The resulting effluent from the papermaking process is ultimately discharged to the Pearl River.

In accordance with the multiple use concept, the Pearl River fulfills the essential function of receiving and assimilating the diluted effluents of our pulp and papermaking processes.

Beginning as a small mill with two paper machines in 1918, the mill has expanded and diversified into an operation that produces approximately 1100 tons of bleached and unbleached papers and linerboard daily.

The Bogalusa Mill manufactures a wide range of kraft papers and paperboard from pine and hardwoods grown in Louisiana and Mississippi. Much of this production is converted into paper boxes, multiwall bags, and grocery bags in the company's adjoining plants at Bogalusa.

The mill, converting plants, and company forestry operations provide full-time employment to more than 3,000 people with an annual payroll of nearly $18-million. Several hundred additional workers are employed by independent contractors cutting and hauling pulpwood to the mill from an area extending 75 to 100 miles from the mill into southeast Louisiana and southern Mississippi.

As the size of our operation in Bogalusa has grown and diversified, we have taken numerous steps to minimize the effect of our effluent on the Pearl River.

Prior to its merger with Crown Zellerbach late in 1955, the Gaylor Container Corporation operated the Bogalusa mill.

Following this merger, Crown Zellerbach began an active program for modernization and up-grading of the mill -- carefully studying and evaluating each part of the operation, and then moving ahead with the necessary capital expenditures.

Obviously, in a program as extensive and far-reaching as we have undertaken in Bogalusa, there is considerable lead time involved between the planning stage and the actual completion of construction.

During the period from 1955 through 1960, more than $15-million was invested in plant improvements and modernization. One of the effects of this program has been a steady and continuous reduction in the amount of organic material discharged into the Pearl River.

Since 1956, screw presses and vacuum washers have been installed to reduce fiber and chemical losses, as compared with the diffuser washers previously used. Additional filters have been installed in the paper machine systems to reduce fiber losses. Various changes have been made to segregate and control sewer losses.

Continuous monitoring devices have been installed at each of the main sewers leaving the mill, which record abnormalities in effluent characteristics, and permit the operator to make rapid changes to bring the operation back into line. The above changes have cost about $3-million, but as a result of these improvements, production increases have been achieved along with actual decreases in the total organic load discharged. As part of our effluent control program we monitor the Pearl River regularly, and weekly summaries of our findings are furnished to the Louisiana Stream Control Commission.

We are currently spending an additional $26.5-million for further expansion and modernization of the Bogalusa mill. We have consulted regularly with the Louisiana Stream Control Commission over the last two years in regard to the combined effluent that will result from our present plant plus the planned increases.

Some of the major elements in this program are replacement of an existing paper machine with a new, modern specialty machine; rebuilding of two paper machines for improvements in quality and production; modernization of stock preparation systems; installation of a new lime kiln to replace older units; and installation of a large new chemical recovery furnace in place of five small inefficient units, which is designed to improve the mill's recovery of pulping chemicals.

Reduction of organic and inorganic materials in the effluent from any plant involves two aspects. First, there are the internal processes which serve to utilize these materials to the fullest extent possible. It is a matter of record that modern pulp and paper mills have significantly reduced losses of chemicals and fibers when compared with their predecessors of 30 and 40 years ago. Our program between 1955 and 1960 outlined above dealt with such internal improvements to reduce losses.

When internal improvements have been made in keeping with the best known practices in the industry, there still remains some loss of chemical and fiber. These losses must be treated separately and independent of the paper-making processes to fit the requirements of the stream which ultimately must assimilate them.

Probably the most important part of our current program, as it relates to these proceedings, is the installation of a new waste treatment plant to treat our effluent prior to the discharge to Pearl River.

Construction of this plant is already well underway, and it is scheduled to be in operation by April 1, 1964, well before the next low water cycle of the Pearl River. This plant will cost approximately $1-million to build.

The plant is located on a remote site about one mile from the mill. All effluents will be collected at the mill and pumped through a 54" concrete sewer line to the treatment plant. The settleable solids will be removed in a 300' diameter clarifier, de-watered, and used for land fill. Only the clarified effluent will be discharged into the Pearl River.

The treatment plant design is based upon careful analysis of data on the Pearl River which we have collected over the past 13 years. These data were reviewed in detail with the Louisiana Stream Control Commission in numerous technical and commission meetings before our application for discharge was approved.

During the past summer, we have experienced what was probably the lowest flow on record for this time of year. When this situation began to develop, we immediately went to work in cooperation with the Louisiana Stream Control Commission to find satisfactory means of protecting the stream during this critical period, while at the same time attempting to assure the continued economic well-being of the thousands of persons who depend upon the operation of our mill for a livelihood.

We constructed a temporary settling basin, installed surface aerators, and took numerous other emergency measures at a cost of more than $150,000 to alleviate this situation, while at the same time going ahead with other programs already underway which were planned to permanently solve this problem.

In summary, we believe that this review of the history and development of Crown Zellerbach's effluent control program for the Bogalusa mill shows that we are making effective improvements and this program has been developed with the full understanding and cooperation of the Louisiana Stream Control Commission and its technical staff. We fully expect that when our present construction program is completed, that the effect of these improvements will be clearly evident and compatible with other forseeable multiple uses of this important natural resource -- the Pearl River.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Dahl. Would you wait right there.

Mr. Johnston?

MR. JOHNSTON: I have no questions.

MR. TRYGG: No questions.

MR. LAFLEUR: No questions.

CHAIRMAN STEIN: I want to thank you for a very excellent statement.

There is just one point for clarification. When you talk about your clarified effluent, you know there are lots of kinds of clarification. The other week we had the privilege of visiting Rome Kraft in Rome, Georgia, where they discharge a clarified effluent. They had primary treatment, several other filters, and so forth, and so on. What do you mean by primary effluent after this construction program? Would that include primary or secondary treatment?

MR. DAHL: This is primary treatment. We would remove the setteable solids.

CHAIRMAN STEIN: I think, just to clarify this, because clarified effluent has a variety of meanings, as you know, primary or secondary. By the way, I do think that it was a very excellent and informative statement, and thank you very much, Mr. Dahl.

MR. LAFLEUR: The next speaker is the Honorable Jesse Cutrer, Mayor of the Town of Bogalusa, Mayor Cutrer.

MR. JESSE H. CUTRER, JR.: Mr. Chairman and conferees, ladies and gentlemen: My name is Jesse H. Cutrer, Jr. I am a resident of Bogalusa, Louisiana and hold the office of Mayor of the City of Bogalusa.

The City of Bogalusa is here at the invitation of the Louisiana Stream Control Commission, and I should like to bring some pertinent information to the conferernce concerning the problem of sewage disposal from the City of Bogalusa into Pearl River.

At the time of the survey of Pearl River by the United States Public Health Service, the city had under construction a primary sewage treatment plant with separate sludge digestion and pre- and post-chlorination systems.

We are happy to report that this plant is now in operation and that two-thirds or more of the total raw sewage of the City of Bogalusa is being treated. This means that the solids have been removed and that the remaining excess fluid is being chlorinated and is completely clear of bacteria.

In a further effort to bring about treatment of a greater per cent of the total sewage of the city, the Bogalusa Commission Council has retained the services of an engineering firm experienced in municipal sewage treatment. This firm is presently in the process of making a survey of the additional needs of the city for sewage treatment and will submit recommendations to the Bogalusa Commission Council, looking toward the accomplishment of this purpose.

We should like to emphasize that it is our full intention to cooperate with the Louisiana Stream Control Commission and the Louisiana State Board of Health in all recommendations which these two bodies may make concerning the solution of the pollution problem of Pearl River. The City of Bogalusa is cognizant of the responsibility it has in this matter, and we feel that our past actions, coupled with our intentions, will continue to produce the desired results.

Thank you very much.

CHAIRMAN STEIN: Are there any questions or comments?

MR. JOHNSTON: No questions.

MR. TAYLOR: No questions.

CHAIRMAN STEIN: May I just again for clarification -- and I thank you again for a very good statement, and we are very happy to see this progress. Do you have any notion as to when you could expect the other one-third of your sewage wastes to be treated?

MR. CUTRER: Mr. Chairman, I must admit that I was not even cognizant of the problem until a few weeks ago. I am a new official in office. I have only been in office for about ten months, and I didn't realize that the problem existed.

When we became aware of the problem, we immediately turned to our engineer for a preliminary survey. At this time, sir, we are in the process of having this preliminary survey made.

I would like to go further, not to be dilatory in any way, and say this. As soon as the survey is completed and we see where we are, and methods and means of financing can be secured, we certainly will move forward.

CHAIRMAN STEIN: I am sure that is the case. Generally speaking, though, even when cities do take preliminary surveys, they do have some idea of when they would anticipate financing and construction -- and I am sure that Bogalusa will do that, your city will do that. I don't think this is the point. I think what we would like to determine, if we can, in our own mind some kind of a time schedule where we can think in terms of a cleanup of the river. The reason for that is, of course, as you know, you do have Crown Zellerbach in the river, and Picayune, and so forth and so on. We will be hearing from the Mississippi people.

Now this thing should generally be dovetailed in a particular way in order to have equity on both sides. In other words, I don't think it would be fair for you people to construct, say within a year or two, and your neighboring cities across the river to wait ten years, or for the situation to be vice versa. We try to see, particularly with an interstate stream, if we can be as equitable and as fair as possible and do something in a reasonable way. This is why we thought it might be possible for some kind of an estimate to come forward as to the time.

MR. CUTRER: Yes, sir. Mr. Chairman, as I pointed out, this treatment plant which we have just placed in operation has only been operating almost a year, not quite a year. It would be our hope, if financing can be arranged, that we could handle it within say two years.

Now I don't know if you have ever had any experience with municipal financing.

CHAIRMAN STEIN: I've lived with it all my life.

MR. CUTRER: This is a problem which we must solve before we can take care of our full problem.

CHAIRMAN STEIN: Sir -- let this be off the record.

(Discussion off the record.)

CHAIRMAN STEIN: Well, we can go on the record.

MR. CUTRER: I would like to say this off the record, also, if I may.

(Discussion off the record.)

MR. CUTRER: I feel real sure though, Mr. Chairman, that within a year and a half or two years we will have it completed. I was only emphasizing the fact that we are now operating to treat two-thirds.

CHAIRMAN STEIN: By the way, we are glad to have the record show that, and I hope we are on the record. As I said, I think the progress you have made is very, very good. The difficulty with this business, you never talk about what you do right. It is always what remains undone.

MR. CUTRER: That's in politics, too! (Laughter)

CHAIRMAN STEIN: But I think, again, as this report will show, that Bogalusa, as a municipality, probably has more treatment than the other municipalities mentioned in this report.

MR. CUTRER: Thank you, sir.

MR. TRYGG: Mr. Chairman, as a matter of record, I might say that we will be happy to put Bogalusa on a priority on the federal aid for treatment facilities. I think, even this year, we might be able to help you. We feel that you can move that fast. But if Congress again votes money next year, we will keep you in mind; and, as soon as you say you are ready to go, we will try to help you with the 30 per cent.

MR. CUTRER: Thank you, Mr. Trygg.

CHAIRMAN STEIN: Thank you.

Mr. Lafleur?

MR. LAFLEUR: These are all the speakers that I have, Mr. Chairman. I have one more, but I would request that he be placed on the agenda for a statement after the luncheon recess.

CHAIRMAN STEIN: Do you want to start?

MR. JOHNSTON: We might as well start.

CHAIRMAN STEIN: May we call on Mr. Johnston of Mississippi?

Thank you very much, Mr. Lafleur and Mr. Trygg.

MR. JOHNSTON: Thank you, Mr. Chairman. Ladies and gentlemen: I would like to make the following statement for Mississippi.

On December 13, 1961, a meeting was held at the Heidelberg Hotel in Jackson, Mississippi to discuss a proposed Pearl River Basin survey and study. Since the Pearl River is an interstate river between Mississippi and Louisiana, this meeting was attended by quite a number of representatives from both states.

Mr. John R. Thoman and Mr. H. C. Taylor, Regional Program Director and Assistant Regional Program Director, respectively, Water Supply and Pollution Control, U. S. Public Health Service, Atlanta Region, and Mr. Jerome H. Svore Regional Program Director, Water Supply and Pollution Control, U. S. Public Health Service, Dallas Region, were present at the Jackson meeting.

After the meeting a conference was held with the Public Health Service representatives, at which time they were requested to aid us in a water quality survey of Pearl River in its entire length. They felt it was entirely possible to receive the assistance of the Public Health Service in this water quality survey if a formal request was made to the Public Health Service.

On December 14, 1961, Dr. A. L. Gray, State Health Officer of Mississippi, wrote Dr. W. H. Allfrank, Regional Health Director, Public Health Service, Atlanta Region, making a formal request for this assistance.

The following is a copy of Dr. Gray's letter to Dr. Allfrank:

"Dear Dr. Allfrank:

"The State Board of Health is vitally concerned with the quality of water of Pearl River throughout its entire course. There are existing situations, new developments, and prospective developments along this watershed which demand increased knowledge of water quality as soon as such knowledge can be obtained.

"Because of the capabilities of the U. S. Public Health Service in making studies of quality, we are very anxious to have the Public Health Service make studies of quality and pollution of the entire length of Pearl River at the earliest possible moment.

"The State Board of Health through its Division of Sanitary Engineering will lend all possible cooperation in promoting the study and will make the information thus gathered available to all of those who might be interested.

"We would appreciate an early decision and reply to this letter.

"Sincerely,

"A. L. Gray, M. D."

This request was made entirely for information for Mississipians who are concerned with the use of water for any purpose, and not as a complaint against Louisiana or any of its citizens. I am sure this survey will be helpful to all of us, and we sincerely appreciate the assistance of the Public Health Service in assisting and making this survey and preparing this report, as well as calling this conference so that the report can be intelligently discussed.

I am sure that any problems that now exist and are pointed out will be seriously considered by those who are contributing to the problem. I am quite sure that the States of Louisiana and Mississippi are fully capable and willing to solve the water pollution problems of Pearl River in a satisfactory manner and in a reasonable time. I believe that other reports that will be made here today will bear this statement out.

Thank you, Mr. Chairman

CHAIRMAN STEIN: Thank you very much, Mr. Johnston.

Are there any questions or comments?

MR. TAYLOR: No questions.

CHAIRMAN STEIN: Will you call your first speaker, please?

MR. JOHNSTON: I believe the first statement will be made by Mr. Garland Lyell, on behalf of the Game and Fish Commission of Mississippi. Mr. Lyell is Assistant Attorney General of the State of Mississippi.

(Discussion off the record.)

MR. LYELL: Mr. Chairman, ladies and gentlemen:

I think New Orleans is a most fitting place to have a meeting to discuss pollution, I was out on the town last night and had an opportunity to observe several hundred, if not thousands, of subjects -- and at least 98 per cent of them were polluted. (Laughter.) And as the evening went on, more and more of these bottom dwelling organisms began to appear, you know. (Laughter.)

This is a brief statement, primarily on behalf of the Game and Fish Commission, and it was prepared by Billy J. Grantham, here. Us lawyers can foul things up with words, and I told Billy Joe, if he would, to prepare this thing, and then I would add the legal hieroglyphics. But when he prepared it, I thought it was sufficient.

The regulatory agencies that are charged with pollution control in Mississippi are the Mississippi Game and Fish Commission, with industrial wastes, and the State Health Department primarily with municipal wastes. Pollution laws regarding industrial pollution were formulated in 1946, and since that time they have remained unchanged. These laws are in need of revision -- and I will depart from the text, here. Our Legislature will meet in January.

As I see it, the primary trouble with our laws, Mr. Chairman, are that when this thing was passed in 1946, there was a savings clause which allowed municipalities, which were dumping sewage into the streams, to continue to do so. It was a prospective thing and didn't cut off the evil that already existed. As I understand from what information I can get, we have very few serious problems in Mississippi. Jackson, the capital city, is the primary sore spot. We have, I think, about 80 to 85 per cent of the raw sewage from the City of Jackson, with a metropolitan area of about 175,000, dumped into the Pearl River. Just above the dumping point, where the City of Jackson has a low head dam to get its municipal water supply, as I understand, it is about as pure as you can get river water. Isn't that right?

The pollution problems are definitely becoming more pronounced each year in Mississippi streams. This gradually deteriorating condition in the aquatic environment is brought about by several factors; increasing growth of urban centers, expansion of industrial production, the widespread use of agricultural pesticides and herbicides, and the extremely low stream flows we have experienced in recent years, and particularly right now.

The water quality condition, as a result of industrial pollution within the state, certainly leaves much to be desired. However, most of the massive fish kills that occur are usually the result of an unfortunate in-plant release into the stream, accidental and casual things. This type of release is usually the result of mechanical failure or accidental spills. Also causing fish kills is deoxygenated water being forced rapidly downstream by heavy localized rains.

There are nine areas in Mississippi where industrial pollutants find their way into water courses and very often nuisance conditions do exist. Two of these areas are located on the Pearl River, at Jackson and Picayune. The remaining seven are at Hattiesburg, Laurel, Tupelo, Meridian, Moss Point, Pascagoula and West Point. Other areas in the state also merit attention, but the nine listed above are the ones that often receive publicity regarding pollution problems.

The State of Mississippi does need a stronger pollution law, and it is hoped that at this next session of the Legislature something can be accomplished.

We are fortunate in having with us here, I will depart from the text once more, an experienced civil engineer, Horace Lester, back here, who has recently been elected to the State Legislature from Hinds County; and, if anybody in the state appreciates these problems, it is Horace Lester. Horace did the majority of the engineering on the Pearl River Reservoir, which will be about a 28-mile by about 5-mile wide lake when it's filled, just above the City of Jackson.

Each year we are having more and more new industries over the state, and this past year alone there have been 41 new industries added to the list of industries that discharge effluents that might cause pollution.

The (Mississippi) Game and Fish Commission, being primarily charged with the enforcement of these pollution laws, has two full-time men in the Pollution Department, plus a half-time man. That is not a sufficient number of men to adequately police the waters and enforce these laws, but they are able at times to call on the personnel of the Fisheries Division of the Game and Fish Commission.

At any rate, as the law is now and with the personnel we have, what can be done is definitely limited. But we do hope, Mr. Chairman -- we have been working on it and various members of the Legislature are vitally interested in this thing, and it is hoped that these laws will be re-worked at this next session of the Legislature -- not with the idea that today we can cure our evils, but with some long range plans to take care of such situations as we have in the City of Jackson.

Finally, I would caution all of you good people -- and I will probably reach my home about 7:30 tonight. I have three sons -- young sons, and I try to be careful about the language I use in their presence; and I am sure that some of you have the same problem, and guard your speech. Please don't say "Crown Zellerbach" or "Crosby Chemicals" in front of your children.

CHAIRMAN STEIN: Thank you. Would you wait and see if there are any questions or comments, Mr. Lyell?

MR. JOHNSTON: I have no questions.

CHAIRMAN STEIN: I have a comment. You know, it is very peculiar about this business. Although we deal with sewage and wastes, you will notice that the professional language used by the scientists and the chemists, biologists, engineers, physicists and biochemists in this field is curiously antiseptic; and I think that is some kind of compensation for all the fields you work in.

Another point, I think -- and this is just a comment -- that in the field of water pollution control, as in many other fields, the incidence of so-called accidental spills sometimes can be markedly controlled. I think we have had situations such as that where we, for years, had a series of accidental spills in the Colorado River System from the uranium mines. These were particularly serious because the ponds were loaded with radium. After a considerable amount of regulatory work and development of a monitoring system, and so forth, we have eliminated practically all of these accidental spills. There hasn't been one for about a year or two. The best method we seem to have for eliminating the accidental spills was just putting a monitoring station to measure the radiation below each mill -- and the incidence of the accidental spills dropped off tremendously.

Now I think, again, down in the Southwest, down in this part of the country, in the South, you probably have had the same experiences we have had with oil well wastes. Again, when they used to keep the oil brines in pits, we used to find a remarkable number of accidental spills. Then we would go around the pits and find that they had convenient valves and pipes in them, which could siphon the brine out of the pits, and so forth, with motors on them. The difficulty with an oil brine accidental spill is, you know, you can trace the salt generally right down to where it came from.

I think the water pollution control agencies here have demonstrated that they could eliminate accidental spills markedly in that industry, too. So I wouldn't say that accidental spills cannot be dealt with with the cooperative effort on all sides.

Mr. Johnston?

MR. JOHNSTON: I would like to call Mr. Tom Crosby, one of the executives of the various Crosby interests, from Picayune.

MR. CROSBY: Mr. Chairman, conferees, ladies and gentlemen:

I am T. L. Crosby, Vice President of Crosby Chemicals, Inc. We are a Mississippi Corporation and have chemical plants at Picayune, Mississippi and DeRidder, Louisiana, and our products are distributed world-wide. Crosby Chemicals has historically and traditionally concerned itself with the improvement and betterment of every facet of life in the communities and areas of both states in which it operates. This concern has always included the protection and preservation of such valuable natural assets as the rivers and waterways of our area. We welcome this opportunity to present this statement of our efforts to prevent pollution and contamination of the waterways affected by our industry, as well as our plans for the future protection of such streams.

The only water courses affected by the operation of Crosby Chemicals in Picayune are the Hobolochitto (or Boley) Creek and Pearl River, the former being a tributary of the latter. We do not want either of these streams to receive any harmful effluent discharges from our plant. This desire is principally because we recognize the importance of pure streams and the preservation of fish and wildlife, but we are also motivated because of economic reasons.

Unlike a paper mill or other types of chemical plants, our plant at Picayune has no waste products to dispose of through its effluent system. Any material escaping from us into Boley Creek represents profits flowing down its course into the river. Inventories of our raw materials and finished products in the manufacturing process are taken three times a day and compiled daily to detect if any of our fractions have escaped by any means. Samples are taken of our effluent ditch each day to ascertain if our recovery lagoon system had developed any default. In addition, water samples of Boley Creek, taken above and below our discharge system, are analyzed twice each week.

The only fraction which could escape our industrial process and which requires a recovery system, is a light fatty acid, one of our saleable products. These fatty acids are of the vegetable type and contain none of the non-biodegradeable constituents of aromatic petroleum derivatives.

However, to avoid any possible contamination of Boley Creek or Pearl River, Crosby Chemicals constructed in 1957 a large holding pond with a series of traps on the discharge side equipped with a skimming device for recovering any light fatty acids that might escape our manufacturing process. This system required an expenditure of approximately $75,000.00. The need for this lagoon was called to our attention by the Mississippi State Game and Fish Commission, and after consulting with personnel of this agency, the recovery and discharge system as well as the series of traps was constructed in line with their recommendations. In fact, we enlarged the system about 25 per cent more than was recommended.

In the past three or four years our company has expended approximately $250,000.00 for better equipment to alleviate any loss of the light fatty acid fraction into the recovery system. This equipment is now utilized in the pre-treatment of Crude Tall Oil and had materially increased the efficiency of our operation by reducing the amount of recovery effort previously required. It has also lessened the possibility of the light fatty acid fraction ultimately reaching Boley Creek by evasion of the lagoon and series of traps.

Incidentally, further trap series were added to our recovery systems in 1959, 1960 and 1961 to increase the efficiency of our plant and further reduce the possibility of any material reaching Boley Creek.

On September 26, 1962, a large fish kill occurred in Hobolochitto Creek and Pearl River. We were subsequently advised that a large slug of some substance had apparently flowed into Pearl River from the Hobolochitto Creek and Crosby Chemicals was suspected as the originating source. We could not discover any material from our system which could have escaped and caused the pollution. Our entire operation for that period was checked and rechecked and no loss of any of our products was found. Any such loss would have been reflected in our daily inventories and production reports, and none was. A thorough examination of our lagoon discharge system and trap series was made and no defects were detected. We requested and secured a conference with the officials of the Mississippi State Game and Fish Commission in an effort to determine any flaw in our manufacturing or discharge system which might possibly have caused this contamination. We have subsequently learned that the infra-red spectra analysis of a chloroform soluable extract from a water sample indicated the presence of fatty acids with and without attached benzene rings. Benzene rings or aromatic compounds of this type are not associated with natural fatty acids except in synthetic detergent materials. Alkyl benzene sulfonate (ABS) is currently under investigation as one of the chief sources of contamination of surface waters. It is a constituent of most household and laundry detergents. We believe there is no evidence to support the presence of aromatic (benzene compounds) associated with vegetable type fatty acids, as produced by Crosby Chemicals. There is a remote possibility of such a contaminant coming from rosin. While rosin has a ring structure, it is classified as a cyclic hydrocarbon and, as such, is susceptible to ring splitting to yield straight chain compounds. Rosin, however, is one of the least volatile of the Tall Oil fractions; so it appears unlikely that it could be present in discharge systems. Our light fatty acid fraction is not an ABS derivative and is completely devoid of benzene rings. Our thorough investigation does not reveal any explanation for the unfortunate pollution of September 26, 1962. Nevertheless, Crosby Chemicals is concerned that this contaminant could have even possibly originated at its plant and further steps are planned to perfect our discharge system.

We are in the process of constructing a 60 to 65-acre lagoon with a series of aeration steps. This will be an added and final process in our discharge system. The construction will require an expenditure of approximately $175,000.00 We are convinced that this added lagoon will absolutely assure no escape of any product. In fact, we believe the system will be so effective that we are considering the usage of the water discharge from the final lagoon for recycling into our plant. If our research and engineering studies prove to be correct, it will probably be better than the water we presently withdraw upstream. We anticipate completion of this lagoon in January of 1965.

Crosby Chemicals, Inc., with its plants in Mississippi and Louisiana, has had the privilege of consulting and working with the stream pollution authorities in both states. We have been impressed with the dedication and sincerity of purpose of both personnel. At all times they have displayed a willingness to assist us in the planning of any of our manufacturing, recovery or discharge processes which would affect the streams of their responsibility. Crosby Chemicals is grateful for the fine program of these officials to assure the purification of our streams and appreciates their co-operation in our effort to secure this objective.

Our company maintains a 2,000-acre game reserve along the banks of the Hobolochitto Creek and has expended large sums to stock this stream with fish native and foreign to this area, as well as to propagate all forms of game and wildlife in the reserve. We most certainly do not want this example of conservation to be marred by contamination.

Crosby Chemicals will continue its efforts to prevent pollution of the Hobolochitto Creek and Pearl River; and, with the continued help it has previously received from the responsible state agencies, is confident that this goal will be attained.

Thank you.

CHAIRMAN STEIN: Thank you very much Mr. Crosby.

Are there any comments?

MR. JOHNSTON: We would like to thank you very much for that statement. I think it was excellent.

CHAIRMAN STEIN: Yes, I think that statement was excellent.

I have a question here, again. As I understand this, from Mr. Fairall's report and your report, there is a difference; but even though there is a difference, I think you have the solution in sight. According to Mr. Fairall, he indicated in his report that discharges from Crosby Chemicals in 1962 caused the fish kill. Your statement says that there is no evidence to show that this came from Crosby.

MR. CROSBY: What I say is that we have thoroughly checked, and we could find no loss of any materials during the two-week period, going back a week, and in that area.

CHAIRMAN STEIN: Right. Again, this is just for clarification. But in any event, you are going to have this new lagoon system in operation by January of 1965.

MR. CROSBY: That's right.

CHAIRMAN STEIN: Which would abundantly protect against this.

MR. CROSBY: Incidentally, that has also been discussed with Mr. Grantham of the State Game and Fish Commission.

CHAIRMAN STEIN: There was one other point here that is still unclarified in my mind. In the interest of clarity, I wonder, Mr. Fairall, if you would look at your statement at the bottom of Page 42. You said, "On the East Pearl River the intrastate waters in Hobolochitto Creek were polluted by waste discharges from Crosby Chemicals, Inc. The D.O. was reduced to an average value of 2.5 mg/l during the survey and the biological samples showed distinct adverse effects from pollution."

Now again, just as a point for clarification. This was done, as I understand it, during the recent survey. If you want to keep all your material in -- and I appreciate that you do -- this is not one of these alleged spills or something which happened, but presumably this is a going situation, as I understand it. Now what material can be coming out of Crosby or anyone else, that might be creating this, if any? In other words, what I am trying to do is for the record, this appears in the summary, and I think you may want to comment on that so we may have a clear picture of it.

MR. CROSBY: In the statement, Mr. Chairman, I pointed out the only fraction in the distillation process that would come out through vacuum equipment would be a light fatty acid of a vegetable type. That material is caught initially in the lagoon system in which we have a skimming device to recover it. That material is saleable.

CHAIRMAN STEIN: Yes, but presumably this is what -- and I certainly don't know the answer to this, but what I am trying to do is find whether we have a consensus here, or a different view. Is this the material that is causing the reduction in the D.O. in the stream, or is it something else, or likely to be something else.

Do you want to enter this colloquy, Mr. Fairall? What did you mean by that last sentence?

MR. FAIRALL: Do you want me on the mike?

CHAIRMAN STEIN: Yes.

MR. FAIRALL: I'm in between the audience and the conferees. At our sampling station near your water intake we had pretty good dissolved oxygen in the stream. At our next sampling station below at, I believe it is Burnt Bridge at the extension of Palestine Road, we consistently had low D.O. in there. Now we did not know of any other discharges to the stream within that reach, other than your discharges, and we came to the conclusion that something was entering that stream which was consuming the oxygen in the stream at a pretty high rate in order to get it down to an average value of 2.5, and that it must be your losses. I don't know whether you could have any other conclusion or not from that information.

MR. CROSBY: No, there would be no other conclusion. The main interest we have is to see that we don't have any losses, because that is dollars and cents to Crosby Chemicals going down that stream.

CHAIRMAN STEIN: I recognize this. Now again, I don't know how the states feel about this - and your primary relation is to Mississippi. If this is true, we have had this before, that there might be something you don't know about; and obviously, it is to your interest and to anyone else's interest to keep this stuff out of the stream

MR. CROSBY: The only thing is that we did not find any of this material in the effluent system.

CHAIRMAN STEIN: Yes.

MR. CROSBY: The water is hot.

CHAIRMAN STEIN: I don't know that that would cause that kind of a reduction in D.O. Again, we will have to check with these people, and you may want to consider this, because we are going to have to adjourn for lunch. But we do have, as you know, some industrial waste specialists on our staff; and, at the request of the state, these people are available to examine into a situation and possibly come up with a recommendation, if this can be traced. Now this is something you may want to consider. But the problem that I have with this, and I don't know that this is necessarily -- I want to put this in perspective. This deals with a relatively small portion of the stream, in any event; but, as Mr. Crosby points out, we want to get this cleaned up. And as it says here in the report, the intrastate waters, not interstate; and we don't have, at least on our own initiative, jurisdiction over those waters, unless asked in by the state. But we would be happy, I think, if you so desired, to help you look into that and see if there is a problem.

MR. CROSBY: We are currently working with Mr. Grantham and the staff there which, I think, if there is a problem, it will be derived in another month or two, anyway.

CHAIRMAN STEIN: I have no further comments or questions. Thank you.

I think it is now 12:30. If we can recess until 2:00, we will look forward to seeing you then. Thank you.

(Whereupon, at 12:30 o'clock, p.m., the conference was recessed until 2:00 o'clock, p.m. of the same day.)

AFTERNOON SESSION

CHAIRMAN STEIN: May we reconvene?

Mr. Johnston?

MR. JOHNSTON: I would like to call on Mr. Jack Reid, City Manager of the City of Picayune.

MR. REID: I am A. J. Reid -- Jack Reid, as Mr. Johnston called me, City Manager of Picayune, and I am representing the Honorable Granville Williams, the Mayor, who expressed his regrets for not being able to attend here.

I do not have a written report, Mr. Chairman, for which I apologize; but for some time the City of Picayune has realized that they have a bad situation with the disposal of their sewage, and we have discussed this for the past two or three years with the Health Department. I am glad to report that we have engaged engineers and they are now working on a plan for a disposal system for our entire sewage system in the City of Picayune.

We are a city of about 9,000 population, with many problems. Among them sewage is just one. We are the nearest city to the Mississippi Test Operation of NASA. We are anticipating considerable growth, and we have combined this program of our disposal system with an expansion of sewage trunk lines within our city.

We, of course, down through the years have advertised our water facilities as being one of the inducements to industries and other things, and we certainly want to get away from polluting that system. The Council of the City of Picayune is 100% in cooperation with this.

CHAIRMAN STEIN: Thank you, sir. Will you just wait?

Do you have any questions?

MR. LAFLEUR: I have no questions.

CHAIRMAN STEIN: Do you have any questions?

MR. JOHNSTON: No. I just want to thank Mr. Reid for his splendid statement. It was very encouraging and we appreciate it.

CHAIRMAN STEIN: How about you, Mr. Taylor?

MR. TAYLOR: I might ask Mr. Reid, as far as the time schedule goes, if he has anything definite on when they anticipate the construction to get underway on your sewage facilities.

MR. REID: We are trying to expedite it. On the time business, like the Honorable Mayor of Bogalusa, we get into so much red tape in the financing, and things of that kind; but ours is pretty important because of this mushroom growth we are expecting down there. So we are expediting it. We hope to have some plans from the engineers, I would say, within six months. If I was going to guess -- and it would have to be a guess -- within 18 months to two years we should have our sewage out of East Pearl River.

MR. TAYLOR: Do you plan that this will be a project that would participate in the federal grant assistance program, Mr. Reid?

MR. REID: Yes, sir. We are going to need all the help we can get. The city is adjoining those operations, where you are impacted. It's a pretty hard burden to finance everything, along with the sewage. We've got to expand our water facilities. Right now we've got about three big major subdivisions under development. The city owns its own natural gas distribution system. Those lines have to be expanded, and, of course, streets built and maintained, and things of that sort. So we are anticipating assistance from the Federal Government, at least on the one-third grant.

I might add this, too, that the missile test operation just below us is where all the canals, locks, and things of that kind are going in. So we are going to have to move.

MR. TAYLOR: Thank you very much, sir.

CHAIRMAN STEIN: Thank you. I don't have anything.

I think we should comment at this point that your schedule and the schedule of Bogalusa seem to be very close together, and I think this anticipated schedule is encouraging, because I think that treatment both by Bogalusa and Picayune would largely eliminate the bacteria loadings on the streams down within limits to where they could be put to the maximum number of uses, and hopefully the maximum amount of safe water contact sports and recreation.

Thank you very much, sir.

MR. REID: Thank you, sir.

MR. JOHNSTON: Right here, I would like to ask the Chairman a question or two, or the other Public Health Service people, about any kind of treatment of wastes, domestic or otherwise, from this testing site.

CHAIRMAN STEIN: This is the first I've heard about that. Among other jobs, you know, I am saddled with this federal installation job. At least, the President has said -- and someone made a remark about his picture, up there, and this was the former President, too. So we have two Presidents now that have indicated that we should take the lead in this. Now up to this point I have heard of no problem about a testing site. My recommendation is, if there is such a problem, you might want to very briefly, or as extensively as you wish, outline for the record, because under the law we can include the federal installations in a conference. We will include any remedial measures in a federal installation in the conference, and up to this time, when that has been done, this has been uniformly successful. We have gotten remedial measures put in where indicated to federal installations.

Now what we would like to do in these installations, and I don't know if this involves both states, generally we like to get the state requirements for these federal installations. I don't know what the situation is here, or whether you have a particularly exotic waste you will have to deal with, or if it is just garden variety material.

MR. JOHNSTON: There is no problem yet that I know of. I don't know what we are anticipating it will be in that area. Possibly Mr. Trombetta could tell us more about it -- what the problem is going to be.

CHAIRMAN STEIN: Have they made an announcement on that to the public as to what they are going to do on that?

Would you identify yourself for the record?

MR. TROMBETTA: S. J. Trombetta, Public Health Service in Atlanta. We haven't gotten anything, other than that there will be the regular in-place engine tests there, which I understand is comparable to those at Redstone on which we are making a study now. But we don't know of any manufacturing process. If Mississippi does, we would be happy to know.

MR. JOHNSTON: As I say, I don't know of any. I just wondered if the Public Health Service is going to be in any position to know.

CHAIRMAN STEIN: I can answer that. We will be in a position to know that. Now if you are going to have something like Redstone, you are going to have a problem. And here, let me give you the problem we have on these installations of sites. I have no idea whether this is one of those or not. Obviously there is no problem. I haven't heard of it yet. But sometimes we get a complaint about a site, and I had a complaint about one the other week in Alaska.

I think we had better go off the record.

(Discussion off the record.)

CHAIRMAN STEIN: Back on the record.

I think we've gotten all the sites, such as the Alaska site and many other secret sites, and we have security cleared people and can clear those up. We are keeping abreast of all defense installations sites. Hopefully we can get information on these sites and get remedial measures put in.

MR. JOHNSTON: Well, that answers my question.

Jack Thoman wants to talk.

MR. THOMAN: Murray, on this particular thing, this is a static test site for engines that is being constructed for NASA here in New Orleans.

Mr. Trombetta didn't go quite far enough. He has been in on this for about a year and a half and has discussed with the Corps of Engineers and NASA officials the potential waste disposal problems from the dumping of any exotic fuels that might be tested. We will continue to follow through with this, as the program develops; and rest assured that if anything does develop, that we will be on top of it. It is not that secret, sir.

CHAIRMAN STEIN: All right. Well, that explains it, and I think that this is a kind of a fuel operation that isn't a simple one, but we've run into this before and I think it can be handled.

Off the record.

(Discussion off the record.)

MR. TRYGG: We had a similar problem here in Louisiana, as you know, and they have gone underground with that.

CHAIRMAN STEIN: Yes. Let me say, I think this is the same thing that we have with paper mills or any other installations that go in. When we have new Defense Department installations going in, the Defense Department now is pretty much aware, as are the other federal installations, of the waste disposal problems that can be created; and we are generally alerted before these go in. I think we are keeping up with all new installations, and there are some old installations which have to be corrected.

I might point out, also, just to put this into perspective, that pollution from federal installations really is a minor part of the total pollution loads in this country. However, we are pledged to show the way and we intend to do that, and any federal installation where we find that there is a pollution problem, action will be taken to correct that pollution.

MR. JOHNSTON: Thank you, sir.

At this time I would like to ask Senator Hugh Boren, who is the Administrative Assistant to Governor Barnett, to make a few comments.

MR. BOREN: Mr. Chairman and representatives here today: I first would like to express to you the Governor's sincere interest in this matter of the pollution of our streams, and I would like to congratulate all those who had a part in the compiling of this report. Certainly this report together with this meeting, which serves as a clinic on pollution, is going to be most helpful, I know, to the State of Mississippi and the State of Louisiana.

We were able to work out with the U. S. Public Health Service the question of the health and safety of our citizens in the NASA area. By the same token, with the aid of the U. S. Public Health Service and all working together, we are going to be able to work out our pollution problems in the State of Mississippi and the State of Louisiana.

I know this meeting today is not for the purpose, by any means, of finding any two municipalities or any two industries guilty of any pollution wrongs; but it is the opening wedge and the eye-opener to all of us to let us know that we have pollution problems. You have mentioned today those problems that have been discovered in the area of the flickering lights on the map, but I am sure that if you went immediately south of Jackson, Mississippi, you would find equally involved pollution problems in that area. Likewise, on the Tombigbee, on the Buttahatchie, and in many other areas of our streams in the State of Mississippi you would find pollution problems. And I know that it behooves us in the two states to compile all the information possible as to what can be done and what should be done to work out these problems.

I can assure you that the Governor, in his inaugural message to the General Assembly that convenes in January, will call this to their attention at that time. And we in certain areas of this state have had it in mind for a long time. Certainly our pollution laws will have to be amended. We are going to have to create responsibilities on the part of our municipalities and others; and, too, we have set up various districts, as in the Pearl River Valley watershed area, which gives them taxing authority. This will be the means and the basis by which even counties may individually or in combination of counties in those respective areas can join with the states.

I want to assure all of you present today that the various departments and agencies of the State of Mississippi, the Fish and Game Commission, the Board of Water Commissioners, our Public Health Department -- all of the agencies -- The Agricultural and Industrial

Board will cooperate in this measure. There will be a job and a thought for each one to consider. For instance, the Agricultural and Industrial Board will want to get allied industries in certain areas.

This question of pollution, of course, in our State of Mississippi has been a problem for more than one-hundred years, when they first started dumping the cottonseed, when it had no use, into the rivers. It created a problem then, and we are going to continue to have those problems. But I assure that we have worked with everyone. I know, and we have found it true here in Mississippi in the past, our industries will cooperate to the fullest extent, and our municipalities likewise will cooperate. This is a job for everyone to do, and I know we are going to do the job.

It has been a pleasure for me to be here today in this meeing. Thank you very kindly.

CHAIRMAN STEIN: Thank you very much.

Are there any comments? (No response.)

MR. JOHNSTON: At this time I would like to call on Mr. Bill Demoran, with the Marine Conservation Commission and also with the Gulf Coast Research Laboratories.

MR. DEMORAN: I am Bill Demoran from the Gulf Coast Research Laboratory, Mississippi Marine Conservation Commission. Mr. Chairman, I have no prepared talk. However, I would like to make a few statements here that are simple facts.

98 per cent of our oyster production comes from the west portion of Mississippi Sound. This area is in the near proximity to where the Pearl River empties into the Sound.

In 1962-63, Mississippi produced one-quarter million dollars worth of oysters. 90 per cent of this figure came from the western portion of our Sound. Mississippi has a total investment of $21.5 million in its seafood industry.

Mississippi presently is enjoying one of the finest shellfish sanitation ratings of any state in the Union. Is that not correct, Mr. Johnston? And we hope to keep it that way.

With our extensive investment in marine fisheries, I think that I can speak for the industry and for our commission in saying that we are certainly interested in the outcome of this hearing. We are interested in the outcome of any state and federal legislation which involves pollution, which might protect our valuable seafood industry.

Thank you.

CHAIRMAN STEIN: Thank you.

Are there any comments or questions?

MR. JOHNSTON: No.

At this time I would like to call on Mr. Jack Pepper, an engineer with the Mississippi Water Board.

CHAIRMAN STEIN: While Mr. Pepper is coming up, let me go off the record.

(Discussion off the record.)

CHAIRMAN STEIN: Back on the record.

MR. PEPPER: Mr. Chairman, conferees, ladies and gentlemen:

My name is Jack W. Pepper. I am a Water Engineer for the Mississippi Board of Water Commissioners.

We have heard a lot of things today about what's wrong with our streams, pollution, and some other problems. I would like to just put a few statements on the record.

We have the tools, that our state agencies have, to work with and help improve this problem and to prevent future problems. One thing that we have in Mississippi, when our Board of Water Commissioners was created, they have the responsibility for appropriating water from streams. The legislature put some guide lines there that require our Board to maintain a minimum flow in the streams. So we will always have this minimum flow in these streams. We will never have to worry about future industries or irrigators drying the streams up to the point where the stream flow standards that are set now will be jeopardized in the future.

We had a study, Mr. Johnston touched on it, where the state and federal agencies were working together on a land and water resource study on the Pearl River. The Soil Conservation Service primarily is working on this, or the Department of Agriculture group. They are spending roughly a quarter of a million dollars a year on the planning part. They will give us information that will be used in conjunction with information from all the other state and federal agencies to where eventually in Mississippi and Louisiana, also, we will be able to develop overall water resource development plans, so that all of the agencies, both state and federal, will be able to work toward solving these problems. If we know where these pollution problems are or potential sources of the problems, then any future reservoir sites can be utilized to store some additional water necessary for pollution abatement.

One thing we haven't mentioned today. Several have touched on the City of Jackson being one of our problem areas. We failed to mention about the Pearl River Reservoir that has been built above Jackson. The Pearl River Reservoir in the permit that our Board issued to them will be required to release twice this minimum flow of the past. That was part of the promotional plan that they had, and they accepted it in the permit. So the minimum flow of record will have about 100 cfs added to that now. That will help solve the problem.

Then, we have a program underway with the U. S. Geological Survey that will help these people who do have waste disposal problems. We have been working on the time of travel. In this program we have used some dyes. We have thrown dyes in the streams and measured the time that it takes this dye to travel from one point to another; and we are doing that at various stages of the river, not just at the low state or the average stages of the stream, but at all different stages, so that you can tell how long it takes an effluent or anything that enters the stream, how long it takes to get to another point.

All of these are tools that Mr. Johnston with the Board of Health, Mr. Grantham and his bunch with the Game and Fish Commission, feel that they are the ones charged with the responsibility in our state to work with these pollution problems. They are doing a good job now, and with these additional tools and additional information that is available, I feel confident that they will be able to solve most of the other problems we have.

CHAIRMAN STEIN: Thank you, Mr. Pepper.

Are there any comments or questions?

MR. JOHNSTON: No, I have no questions. Thank you, Jack, very much for that report.

Mr. Stein, I hope that you will forgive me for calling on so many people from Mississippi this afternoon, and I hope the people from Louisiana will, too. But I hope that this has impressed you, as well as all the rest of us here, that our interest in cooperating with the people in the various agencies in the State of Mississippi in our concern and determination to do something about the water pollution problem.

I believe that that is all at this time that we will call on. There is one other. Mr. Beggenly wants to talk a little later. I think that his comments will be made after Mr. Fairall comments on a summary of the intrastate part of Pearl River, after we are through with the interstate problem of Pearl River.

CHAIRMAN STEIN: I think we are about settled on the interstate part. If you want to call on Mr. Fairall, why don't you call on him now.

MR. JOHNSTON: Fine. Mr. Fairall?

MR. FAIRALL: In connection with the survey I have already reported, at the same time there was a survey going on on the upper Pearl, from Jackson on down to Columbia. It was a cooperative activity with the Mississippi State Health Department and representatives out of our Atlanta office.

We did write up a report as a result of this data, and I would like to present some summary statements at this time.

Bear in mind that what I was doing this morning in talking about D.O., bottom organisms, and the other parameters, and on to the values we are talking about down on the Lower Pearl.

The raw water intake for the City of Jackson is an example of a clean stream station on the Pearl River, and serves as a base line for the Upper Pearl. I might ask you to look at this map, here. I do not have any slides of our report, but this may help you orient a little bit.

For the first four stations below the City of Jackson there was not any dissolved oxygen present in some samples during the survey; and, for the first station below Jackson, the presence of dissolved oxygen was never observed.

For the first three of these four stations the average coliform density was from two to more than seven million. We are talking about millions now. This morning we were talking about hundred thousands. Now we are talking about millions below Jackson -- MPN 100 ml.

In a previous survey it was indicated that the major pollutional load for the Pearl River was derived from the City of Jackson. The City of Jackson is still the major pollutional load on the Pearl River within the State of Mississippi.

The number of bottom dwelling species was reduced to four immediately below Jackson, compared with 28 species immediately above Jackson. The species below Jackson were two types of sludgeworms, a leech, and an aquatic moth. This degraded river bottom was outlined with a red border of sludgeworms along the river banks for 20 miles below Jackson, and sludgeworm numbers were 21,000 per square foot. With the exception of gar, no fish were found in this previous survey immediately below Jackson. Even 20 miles below Jackson the fish population was not yet normal compared with the normal fish population of the river. The pollutional influence on fisheries was estimated to extend for 40 to 60 miles below Jackson, which would be below the mouth of the Strong River.

Around Terry, Mississippi, the first four stations below Jackson included that reach of the river down to Terry, Mississippi. The next three stations below Terry, which is down to the mouth of the Strong River, are in the reach of the Pearl River which was recovering from the heavy pollutional effects originating in Jackson. The dissolved oxygen was on the increase, and the coliform concentration continued to decrease as the bacteria died off.

From the observations made at the sampling stations above and below Monticello, it did not appear that the oxygen was adversely affected by any wastes discharged at Monticello. However, there was an appreciable increase in coliform concentration.

The samples collected above and below Columbia showed a very substantial increase in coliform densities below Columbia. No specific pollutional influence on the biology of the stream was observed above or below the same city.

The utilization of the stream's banks as a town dump by the City of Columbia does not seriously influence the biota of the stream. The major detriment of this dump is its effect on the aesthetic and recreational value of the stream. These effects are not confined to the immediate vicinity of the dump, but are obvious downstream. Trash in its many forms is transported by the river, especially during high water periods, and deposited downstream from the river bottom, along the bank, and suspended in low hanging trees and brush.

The wastes discharged to the Pearl River from the Jackson metropolitan area degrade the stream between Jackson and Terry to such an extent that legitimate use of the water is prevented or is extremely hazardous to human beings. In the recovery zone between Terry and the mouth of the Strong River, legitimate use is still restricted and the stream never returns to a quality equal to that above Jackson. It is regrettable that in a densely populated part of the state the principal stream is not usable for recreation, and is unsuitable to support a normal fish population.

The wastes discharged by other communities along the Upper Pearl pollute the stream with bacteria for short reaches so that water contact sports would be hazardous to human beings. Aquatic life is apparently not affected by these other towns.

CHAIRMAN STEIN: Thank you very much.

Are there any questions? (No response.)

MR. JOHNSTON: Thank you very much, Mr. Fairall.

Now Mr. Beggenly will make his comments. Mr. Beggenly is a land owner and lives on the banks of the Pearl River below Jackson.

MR. BEGGENLY: Mr. Chairman, ladies and gentlemen:

I appreciate the opportunity to come down here today. I have been up since 3:00 this morning, and I need a shave and a little sleep. Maybe tonight, if Mr. Lester can keep awake going home, we can get there.

I represent the Pearl River Purification Committee which was put together some four years ago in Rankin County. We have begged, asked and pleaded that something be done about this river below Jackson.

You heard Mr. Fairall's report of the water conditions south of Jackson -- and it is strictly that way. I was on this bridge at Byram on the day before yesterday with a group of people, and this river is actually rotten. That's what it amounts to; it's actually rotten. You can smell it roughly a quarter of a mile from the stream.

These people below Jackson are getting very angry about this situation. We know not where to go, and that's the reason that I am here today. They asked me to come down and see what we had in this meeting and see if we might could get some help out of it.

This committee has met with the city fathers in Jackson a number of times, in which we have been promised -- we have had just a whole lot of talk, but very little movement. Since December 20, 1959, when these seven men were put together, two of them are representatives out of Rankin County and one of them is a Senator; we have made no progress whatsoever in getting anything done on this river.

We have one 16-acre lagoon in service. You know how I hear you people speak of 8,000 or 9,000 people's raw residue going into the river, and we have roughly 200,000. Our river is smaller at Jackson than it is at your place. So you can just visualize the situation that we are in.

But going back to the Mayor and Commissioners in Jackson, I will say this; that they are building one 75-acre lagoon and one 90-acre lagoon; one on the north side of town, and one on the south side of town. I talked with one of the engineers that's involved on this, and he said it was possible it would take care of about 30 or 35 per cent of the sewage. But we are moving at a snail's pace. We have been four years getting this done. If we continue to grow and continue to move this slow, we will never get the sewage out of Jackson.

Thompson tells us that it's the financial end of it. He told us some three years ago, when our Legislature was in session, that if he could only get ½-cent increase in city taxes, he could move forward with this sewer program. We agreed to get out and work and help get it moving, and get that ½-cent through. When we got it through, well, he flat-footed denied that the ½-cent was earmarked for the sewage.

So you people say, "Well, that fellow had got fire in his eyes, or blood in his eyes." I have. This thing -- it makes me hot. I have tried to exhaust every way peacefully to get something done on this situation; but, when I go back, I see no way to go. And I told Thompson Thursday -- I talked to him about 45 minutes -- that I could see no way to go except into court.

I hate to see the day when two counties, like Hinds and Rankin, have to tie-up in a lawsuit to get something done under conditions like we have at Jackson.

I have quite a bit of letters, arguments pro and con of who did it and who didn't do it. One blames a filter plant, one will blame the City of Jackson, and it just keeps us running from one thing to another.

We have dairy farmers that are down that river, that I know of. Some of them are in around the property that I own down there, and I know that their cattle are in there on this river. They drink this water when they can drink it, but they cannot drink it now because it is rotten. These cattle will go to that river, they come to the dairy barm, they are milked; then that milk is distributed out to our people in Jackson.

I don't know how many people know this. You talk raw sewage into the river to the people at Jackson, and they look at you like you're crazy. I think that actually only maybe 10 to 15 per cent of the people realize we've got this health hazard of this kind at Jackson.

Now summing this up, I just hesitate to go on. I feel like this meeting today is more interstate than it is our personal battle. I was talking to the Mayor of Columbia this morning here, and he said that he definitely wasn't affected from our sewage at all in Jackson. That's the reason that I hesitate to go on in and take up any more time on our situation up there, but I am very definitely going to go back to these people. I have held them off the city, thinking that we would get some help and get some relief in this thing; but I see only one way to go, and, when I go back to Jackson and this committee meets, I will suggest to them that we go to the courts to get something done about our pollution situation in Jackson.

I say again, I appreciate the time allowed me here. If there's any questions that any of you have, I will be glad to try to answer them.

CHAIRMAN STEIN: Do you have any questions?

MR. LAFLEUR: Nothing.

CHAIRMAN STEIN: I think, Mr. Beggenly, what you have talked about here is some of the material we have gotten from Mr. Fairall. Unless someone else has some other information. We have really gross pollution. That is what you might expect when you put the untreated wastes from a city of 150,000 into a stream.

MR. BEGGENLY: It's deplorable, Mr. Chairman -- absolutely deplorable.

CHAIRMAN STEIN: I can appreciate what you say because, again to get to other areas of the country, this kind of thing was going on and the people in the city didn't know it. In the cities along the Missouri River, before the pollution campaign got started, the refuse collectors and the garbage collectors would gather up the garbage in trucks. They were private scavengers. Then they would drive to the Missouri River and just dump it. They would dump stuff, such as iceboxes and everything else, into a dump on the side, and then they would bulldoze it into the river. Every once in a while the freezing units would break, and the chemicals would come out and singe all the scales off fish, and cause tremendous fish kills. When this was called to the attention of the people, they stopped it; and you would be surprised that people could live in the city and didn't know that.

In the City of St. Louis -- and I hate to keep going on at St. Louis -- but in the City of St. Louis they were more sophisticated than that. They had their garbage and refuse collection. They took it to a nice municipal building, with a neat facade; had the trucks back up, and all they did was grind it into smaller pieces so you couldn't see the material float. They had a pipe and flushed that into the river about 1,000 yards away. That was on the average of 300 tons a day -- and the people of St. Louis didn't know it, or very few of them did. When they discovered that, of course, they put in a different system.

By the way, in St. Louis this refuse and garbage was just a minor part of the waste loading they had, but it was still significant and will give you a notion of the magnitude of that.

Now the problem we have, Mr. Beggenly, is that under the federal law, unless pollution in one state endangers health or welfare of persons in another state, we have no jurisdiction on our own initiative.

MR. BEGGENLY: I realize that.

CHAIRMAN STEIN: That is the case here. We would be happy to cooperate with you in any way the laws allows, and in this case that means we would give any technical assistance asked for by Mr. Johnston and his group. I don't know that in a gross situation like this that technical assistance is what is called for or what you need. I am sure Mr. Johnston knows the answers.

MR. BEGGENLY: I am very much of the opinion that if our people, as far as our city fathers worrying about this money, I think our people are not ignorant around Jackson. I think that if this is brought to their attention and if they are told that this is a health hazard -- and it's very definitely a health hazard -- if they are told that it is, I don't think that we would bog-down financially in any way in promoting these lagoons and getting this job done.

CHAIRMAN STEIN: I think again, Mr. Beggenly, the facts speak for themselves. We have heard Mr. Fairall's figures. Unless they are disputed, where you have a zero oxygen for that amount of time, and where you have coliform counts such as he recounted, I don't think that there can be any doubt about what the situation is and what the hazard is. I certainly wouldn't want to get near the river up there, and I certainly wouldn't want to have my children get near it.

MR. BEGGENLY: I've seen fish, year after year -- of course, I don't stand up here to argue the fish end of it, because I think that we are past the fish end. I think we are to where it affects my health and it affects my kids' health and my neighbors' health.

I appreciate the time taken and given me here. Thank you.

CHAIRMAN STEIN: Thank you very much.

MR. JOHNSTON: Thank you, Mr. Beggenly.

I am sure Mr. Beggenly will recall that Dr. Gray, our State Health Officer, made two speeches recently in Jackson before large groups that pointed out this problem in Jackson. That caused quite a bit of comment in town and a number of articles in the local newspapers.

Now Mr. Lester, who is a consulting engineer from the City of Jackson, had indicated he would like to make a remark. I think that after what has been said here, I think I should call on and give Mr. Horace Lester an opportunity to make a statement.

MR. LESTER: Chairman Stein, fellow conferees, ladies and gentlemen:

I am in a little bit embarrassing position, being a newly elected public official, I'm not used to talking over the microphone or anything like that. Another thing that worries me so badly is that my wife makes my children promise every morning, before they leave for school, that they won't tell a soul their daddy deals in sewage for a living (Laughter.) But I believe I'm in a group now that will let me talk about it just a moment.

I am down here as a representative from Hinds County, interested in cleaning up the streams of the state. It just so happens that my firm, among others, one other principal firm, is the firm that has been working on the City of Jackson's pollution problems for three years. We have, like other communities, I'm sure, a difficult time in bringing public relations to sewage treatment works. The 30 per cent figure, that Mr. Beggenly gave you, is substantially true. I'm quite proud of that. We haven't had a big bond issue yet for sewage in Jackson. I believe we are going to make it.

We have been working on this problem about three years. We have been detained mainly because our principal sewage treatment plant location is involved in a government flood protection control project, and also involved in the intersection of two interstate routes. A lot of you people here work for the government and are familiar with these details, and I am sure you all know what we're up against in the way of coordination and getting all the different facets together. It's almost an impossible situation, but I believe we are going to make it.

I would like to point out to this group, one thing though, while I'm here. The first thing you need in any public project is to determine a need, or to find the need. People dealing with pollution have the need. That is only one of six steps. After you determine the need, you need to determine whether or not physical improvements can be brought together to do whatever you want to do. After you do that, you must determine whether or not the benefits to ensue are overall beneficial to the community. You can spend a billion dollars for cleaning up your streams, and get 50 cents worth of return -- and that's not a good deal. There is a balance in there somewhere.

After you do that, you must develop an authority to create the agencies or to do these things that must be done. In Mississippi we have some laws that need to be revised, some laws that need to be changed, in order that we can clean up our state.

The Mayor, this morning I noticed he touched right quick on one, and that is the financing. It is easy enough to sit back and say, "Now let's just float a big bond issue and clean up the stream." But when you have a municipality there that's already up to their debt limitation on assessed valuation, there won't be anybody to buy the bonds. So although you can pass a law, the last thing you've got to have is money; and, if you come up with a bond issue that the community cannot afford to pay off, you cannot sell your bonds. Without money you can't even clean up a ditch, much less the Pearl River.

Then, when you wrap all of those things up, and come up with what we term public support -- and I think one of the things that will come from a meeting such as this today, especially among our group from Mississippi, is that when we go back home we will have more support for our pollution control program than we did when we came down here.

As far as the City of Jackson is concerned, I look forward to taking a sewer ditch and making out of it one of the most beautiful streams in the country, some time within the next five years.

CHAIRMAN STEIN: Thank you, sir. I don't think it is any secret how you got elected to office. (Laughter.)

Do you have anyone else, Mr. Lafleur?

MR. LAFLEUR: Yes, Mr. Chairman, I have one more speaker. He is Mr. Charles Borch, Executive Director of the Louisiana Wildlife Federation, an incorporated group of sportsmen's clubs in the State of Louisiana. It is my pleasure at this time to introduce Mr. Charles Borch.

MR. BORCH: Thank you, Mr. Lafleur. Mr. Chairman, conferees, ladies and gentlemen: As Mr. Lafleur said, my name is Charles Borch, Jr. I have the pleasure of serving as the Executive Director of the Louisiana Wildlife Federation, Inc. The federation is a citizens' organization composed of sportsmen's clubs, individual members and numerous supporting business firms. Our citizens group has been in continuous operation for 24 years.

We strongly endorse the policy of the Louisiana Stream Control Commission to provide surface waters for multipurpose use, and commend them for their endeavors to provide this worthy objective. Our group is quietly concerned with the conservation and protection of our natural resources.

Personally and professionally, I have fished, boated and hunted on the Pearl a great many times. I have made many excellent catches of bass and bream. However, I do not use this area now, as I feel its productivity has been reduced. I fish elsewhere. Many times I have in past years met sportsmen using the area from New Orleans, from Florida Parishes, Baton Rouge, and from Mississippi.

The wealth of an area is not only the total sum of goods and services produced, but also the exchange of goods and services. The monies expended by sportsmen are now lost to this area, as sportsmen and tourists are seeking their recreation elsewhere. If the quality of the water is improved, I am certain that high recreational use of the Pearl will take place.

One of every three households in the Pelican State has one or more hunters, anglers or boaters. Although Louisiana has only about 3-1/4 million persons, I feel it should be noted that within a 300-mile radius of the Hub City of Alexandria the population is closer to 13 million people. With improved automobiles and new super-highways and interstates, the recreation seeking public will seek the outdoor pleasures of the Pearl if its waters are improved.

Sportsmen of Louisiana now spend some $135-million annually, and additional expenditures can be expected if the Pearl can be restored. We have an exploding population, with more leisure time and more disposable income. We travel more, live longer, and retire from our job earlier, and with benefits.

It is essential that we have clean and pure streams. Complaints relative to pollution of the Pearl and its system have been too numerous and for too many years. The river should be used -- not abused. Outdoor recreation provides wholesome recreation and intelligent use of leisure time. It is socially accepted, and enjoyed by youngsters as well as adults of both sexes.

With our semi-tropical climate, many phases of outdoor recreation can be enjoyed the year 'round. Outdoor sports serve as a deterrent to juvenile delinquency and to mental health problems. Therefore, wildlife conservation gives us the ultimate desired result; that is, human conservation.

Some progress has been made, but we need more progress soon, if not now, to clean up this interstate system. The Pearl was a gem. We trust its quality, its lustre, and its value will be restored as a result of this conference.

Thank you very much.

CHAIRMAN STEIN: Are there any comments or questions? (No response.) Thank you very much.

Before we begin to summarize or have a discussion, does anyone in the audience feel they have anything to add? If not, let's see if we can perhaps combine a summary and discussion at the same time.

I think we have fairly well established that the Pearl River System is an interstate river within the meaning of the Federal Water Pollution Control Act.

I would like to take up the one part, which we mentioned in passing, which probably will be out of the scope of the jurisdiction of the conference as it is constituted and as it is called by the Secretary. The only pollution subject to abatement under the initiative of the Secretary and within the jurisdiction of this conference subject to abatement is pollution originating in one state and endangering the health or welfare of persons in another state. I think there have been statements here which have been uncontested, and I have no doubt they reflect the facts that the untreated sewage from the Jackson metropolitan area, Monticello and Columbia are entering the Pearl River and causing intrastate pollution. And I might say that this pollution seems to be clear, undisputed, and massive. This is a problem under the state of the law for Mississippi to deal with, with the jurisdiction within Mississippi

I might say for our Department of Health, Education, and Welfare, we stand ready at the call of Mississippi to provide any assistance we possibly can with this matter. I might say that this may not be a really over-generous offer at this time because I have no doubt that the State of Mississippi has the full technical competence to deal with it, and I am not sure that specialized technical assistance is what is needed here, but just the will to put the remedial works in and get the job done.

So much for that. Are there any comments or questions?

(No response.)

CHAIRMAN STEIN: Another point we may mention is that in the Pearl River System, and I am talking about the interstate pollution situation, we have damages endangering health or welfare of persons in Mississippi and Louisiana from untreated municipal sewage discharged by Bogalusa, Louisiana, and Picayune, Mississippi. We have heard representatives of both cities indicate that if financial arrangements can be made, and they are working toward that, it is believed that in two years construction can be started on remedial works for both these cities. The type of construction and permits for it. of course, have to be obtained from the respective state agencies. Knowing these state agencies, we know that their requirements will fit the situation when the permit is issued to these two communities.

I think, at least, speaking for us, and possibly the states, that we can endorse this kind of approach by the representatives of the two cities.

MR. LAFLEUR: Right.

CHAIRMAN STEIN: I think we also come down to the question of industrial wastes discharged by Crosby Chemicals, according to the report of our investigators, were considered to endanger the health or welfare of persons in Louisiana. We did hear from Mr. Crosby and he indicates that a complete lagoon system should be in operation by January 1965. I think, again speaking for us, we can endorse the date of 1965, and we would hope that this would considerably alleviate the situation.

In addition to that though, I think we have had statements indicating that pollution may be occurring on a day to day basis from the Crosby operation. This very well may be intrastate in nature. I do think that the pollution, or the evaluation of pollution is just a measurement of the physical facts. I do think that here technical assistance may very well be worthwhile. I have no doubt that the Crosby Enterprises, or any business like that, doesn't want to lose materials; and, if any is escaping and degrading the water quality, I think this should be investigated. I do think that this Department, if requested by Mississippi, will be prepared to offer technical assistance if you want that evaluated; or, after that is evaluated, we can come up with recommendations. I think this should be of interest to all parties concerned; Crosby Enterprises, us, and Mississippi. I think all the interests are the same here, in getting the facts and seeing what can be done about it.

I think the question of whether the Pearl River System injures the oyster beds of Mississippi Sound is one which possibly needs further study. There is no indication now that pollution from the Pearl River System deleteriously affects the water quality of Mississippi Sound so as to be below standards for harvesting the shellfish under conditions which have been surveyed. But the investigators indicate that further study may be necessary, and I should emphasize this is just as a precaution. I don't want any indication that any of the shellfish are anything but safe, but further investigation should be made under heavy flow conditions to indicate what the situation is.

Again, I think we in the Department, if requested, would cooperate with the states on that kind of a survey.

MR. TRYGG: Mr. Chairman?

CHAIRMAN STEIN: Yes.

MR. TRYGG: This is a planned part of a Louisiana survey, and we have not had any water conditions that we could sample. This is the only reason we haven't done it since the last sampling, but previous records of the Board of Health indicate they have never had problems with the Pearl in this respect.

CHAIRMAN STEIN: Thank you. I think we possibly see eye-to-eye, and I will say this. Perhaps this problem of this sampling, if it occurs, can be handled purely by Louisiana, or by Mississippi, or by the both of you, without us. If so, we would be delighted. This is the way it should be done. But if you feel that we can be of assistance, our assistance is here; but I think the first move is for the states to see if they can do it themselves.

MR. JOHNSTON: This has been discussed by Mr. Trygg and me, the possibility of making the joint study at high flow of the Pearl River -- but we haven't had a high flow.

CHAIRMAN STEIN: I recognize that you have not had a high flow of Pearl River. What I am suggesting is that we recommend, as a first call, a joint study between - engaged in, between the two states. If you should think that we can be of help, just call on us; but we would be delighted if you did this on your own, and we know the kind of professional work you have done. Your studies and results are good enough for us. So any way you want to proceed with it. I really don't think here -- I know we have talked a lot about this -- but I don't think that shellfish is indicated to be the subject of a present acute pollution problem, because evidently there is no indication of pollution there.

There are three points to the pollution problems that we have, and we have just covered two of them, so far:

1. It is pretty definite about the untreated sewage from Bogalusa and Picayune.

2. We have the question about what is coming out of the Crosby Chemicals, Inc., and that has to be investigated.

Now we come to the third one, and the determination made by our investigators is that under present conditions, pulp and paper mill wastes discharged by the Bogalusa Division of the Crown Zellerbach Corporation endanger the health or welfare of persons in Mississippi. We have heard the plans outlined by the people from Louisiana and by the representatives of the mill of what is going to happen, and we have heard from Mr. Fairall.

I think, as in all pollution control operations, there are various ways of looking at the problem. I think the Louisiana authorities have taken the approach that a discharge of 62,000 pounds B.O.D. is the way to get at the problem and to meet this problem here. This is a perfectly reasonable and acceptable way for a state agency to operate, and Louisiana has a very good state agency.

From the point of view of the Federal Government, after talking with our biologists, I would like to put this another way in view of the effect of the stream on wastes, at least as proposed, the way we see this. If there is a critical time during the spawning season, and, as I understand, the spawning season for the propagation of fish in the Pearl River is between February and June, our people would like to see that a minimum of 4 ppm of dissolved oxygen be maintained within those months and a minimum of 3 parts within the rest of the months.

This does not mean that Louisiana in any way, shape, or means adopts this stream standard formula, or that this is the stream standard formula. I have no doubt that what they are proposing in Louisiana will achieve these results. This is to assume that the production levels of the mill are what they are now. If this is to be maintained, and production goes up, obviously additional treatment is necessary.

Now I think we can really put forth in relatively crystal-clear fashion the problem facing the states, the industry, the people of this river basin, and the Federal Government -- and this is no easy or small question. This is the question of whether the Crown Zellerbach mill puts in primary or secondary treatment. This is a question which may be rather close to the line, and the difference between primary and secondary treatment is a considerable amount of money. Also, the in-plant waste reduction indicated by the mill may go a long distance in providing what would have been provided by secondary treatment.

So the proposal that I would make is that if Louisiana thinks this is appropriate, the recommendation they made of limiting the waste discharge from the Crown Zellerbach mill to 62,000 pounds, as measured by B.O.D., be tried with the notion that this would provide conditions as outlined during the propagation season of 4 ppm dissolved oxygen and 3 ppm the rest of the year.

Is that all right?

MR. LAFLEUR: We are agreeable.

CHAIRMAN STEIN: I think this about covers the summary or the conclusions. Do any of the conferees have anything to say?

(No response.)

CHAIRMAN STEIN: Do any of the people in the audience feel that they want to say something? (No response.) If not, I would like to thank you all very much for coming.

Before we stand adjourned, I would like to say that we will in conjunction with the states monitor the river, checking from time to time, or perhaps continuously, on the compliance with or the meeting of these time schedules.

By the way, when will Crown Zellerbach's plant be completed? Do you have any idea?

MR. TRYGG: I think he said April of '64. The statement says April, 1964.

CHAIRMAN STEIN: Yes -- and for a determinatior whether, one, the works go in in time; and, secondly, whether the works will achieve the desired results. If neither is obtained, or the states decide that their purposes would be served thereby, the conference will be reconvened on the calling of the chairman. This is, of course, that I can't derogate from the Secretary's responsibility to do what he wants to do under the law.

With that, I would again like to take this opportunity to thank you all for coming, and I think this was a very productive conference. I think this is an example of what we can do by a cooperative federal-state program. I would like to say to those out in the audience, that haven't realized this by now, that this in my opinion has been one of the best conferences we've had because we really have a bunch of "Old Pros" up here, working at this. I have known several of the people at this table for lo, these many years, and have worked through many, many, many problems with them; and I think we have come a long way since our first enforcement case, which also involved Louisiana and Corney Creek.

Thank you very much, and our meeting stands adjourned.

(Whereupon, at 3:25 o'clock, p.m., the conference was adjourned.)